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ASDF PLANS TO HAVE 14 C-130 TRANSPORTS BY FY 1987

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 pp 7, 8

[Text]

With expected authorization to procure six Lockheed C-130 Hercules transports in FY 1981, the Air Self-Defense Force plans to have a fleet of 14 aircraft by FY '87, inside sources say.

According to present ASDF planning, six C-130s will be funded in FY '81. Two will be delivered in FY '83 and four in FY '84. An additional six will be ordered in FY '83. Three each will be delivered in FY '85 and FY '86. The last two aircraft will be ordered in FY '85, which will be delivered in FY '87.

In order to study the prices of the first six aircraft which will be included in the FY '81 budget request, the ASDF will dispatch three staff officers to the United States in early September. The Air Staff Office has received from the US Department of Defense data describing general estimates for these aircraft. The visiting ASDF officials will study details of the estimates in order to prepare for the coming budgetary negotiations with the Ministry of Finance.

Including spares and support equipment, the six C-130s are expected to cost more than ¥30,000 million. Present indications are that they will be imported through the government-to-government FMS channel.

CSO: 4120

MILITARY

MORE INFORMATION RELEASED ON F-15 ENGINE

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 p 8

[Text]

The ASDF obtained approval in recent negotiations with USAF authorities for release of more information on parts and components of the Pratt & Whitney F100 engine of the ASDF F-15 fighter.

Over 10 parts and components of the F100 engine will be added to those to be locally produced under a second contract. The first contract covers local assembly of engines imported in a knocked down form. Delivery of these will begin in April 1981, followed by those incorporating locally manufactured parts and accessories.

Items recently approved for local manufacture include turbine discs of the first and second stages of the F100 engine, single and dual excitors, and the fuel control augumentor. Advanced techniques for manufacturing turbine blades, such as sintering and single crystal forging, were not released although Japanese manufacturers have expertise in using such techniques for other engines. The electronic control unit for the engine was also not approved for local manufacture.

CSO: 4120

MHI EYEING NEXT-PHASE SUPPORT FIGHTER DEVELOPMENT

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 pp 8, 9

[Text]

Mitsubishi Heavy Industries Ltd. (MHI) has started intensive research on the next-phase support fighter, codenamed FS-X, to replace the F-1. MHI was requested by the Japanese Defense Agency (JDA) to undertake research and development of a control-configured vehicle (CCV) seen as the basis for the FS-X.

Kawasaki Heavy Industries Ltd. (KHI) and Fuji Heavy Industries Ltd. (FHI) are already competing for development of the MT-X next-generation medium jet trainer. Thus, Japan's three major aircraft manufacturers have started research and development on new types of military aircraft.

MHI developed the F-1 for ground support missions from FY 1972 to 1975 under a contract with JDA, and then, delivered 39 F-1s to the Air Self-Defense Force (ASDF). Just after F-1 development ended, it began basic research on the FS-X.

Although MHI has yet to decide specific performance details of the FS-X, including speed, cruising range and maneuverability, it has established basic policy of introducing CCV technology fully. Therefore, its CCV research will virtually lead to the FS-X's development.

The company intends to finish research on the FS-X by the end of FY 1983 because it will have to start development of the aircraft that year or the next to meet present planning of having the FS-X replace the F-1 from around 1990.

The JDA has decided to replace F-4s of the 10 ASDF interceptor squadrons with F-15s, while F-86Fs of the three support squadrons are being replaced with F-1s. The agency is now watching the United States' plan to stretch the life of fighters in an apparent bid to applicate it to Japanese military aircraft. If MHI's research and development of the FS-X make smooth headway, however, the JDA will lean toward replacing the F-1 with the FS-X.

CSO: 4120

MILITARY

GOVERNMENT DEVELOPED SHORT-RANGE SAM SELECTED FOR ASDF

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 p 9

[Text]

The Japanese Defense Agency has decided to adopt the Tan-SAM short-range surface-to-air missile of Japanese development for the Air Self-Defense Force. Funds for procurement of four sets will be included in the FY 1981 defense budget request. Including six sets for the Ground Self-Defense Force, a total of ten sets will be included in the FY '81 budget request which will be submitted to the Ministry of Finance at end end of August.

The GSDF will deploy a total of 24 Tan-SAM sets in the northern area under the current Medium-Term Defense Program as replacements of Sky Sweeper AA gun systems. The ASDF plans to purchase 12 sets for air defense of airbases and radar sites under the same MTDP.

The Euromissile Roland all weather, radar homing missile had competed with the Tan-SAM of Japanese development. The JDA made a final decision on use of the Japanese missile for both services, considering the state of the local industry and reducing costs by quantity purchases, sources report.

CSO: 4120

MILITARY

MILITARY AIRCRAFT INVENTORY AT THE END OF FY 1979

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 p 10

[Text]

The Japanese Defense Agency revealed last week that there were 985 major front-line aircraft in the Self-Defense Force inventory at of the end of FY '79, or March 31, 1980. A breakdown follows:

GSDF

Ten LR-1 liaison/reconnaissance aircraft, 119 OH-6 observation helicopters, 138 HU-1B and -1H multimission helicopters and 54 V-107 transport helicopters.

MSDF

Five P2V-7 antisubmarine patrol aircraft, 80 P-2J antisub aircraft, 19 PS-1 antisub flyingboats, four US-1 search/rescue flyingboats, 63 HSS-2 antisub helicopters and six V-107 mine-sweeping helicopters.

ASDF

One hundred and twenty F-4EJ fighter-interceptors, 158 F-104J fighter-interceptors, 55 F-86 support fighters, 39 F-1 support fighters, 62 T-2 trainers and 30 C-1 tactical transports.

CSO: 4120

MILITARY

FY '81 SDF EQUIPMENT PROCUREMENT PROGRAMS

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 5-6

[Text]

Top officials of the three Staff Offices and the internal bureaus of the Japanese Defense Agency have almost finalized procurement programs of military equipment which will be included in the FY 1981 defense budget request to be submitted to the Ministry of Finance at the end of August. A service-by-service breakdown of major equipment expected to be requested in the budget draft follows:

*Aircraft

GSDF --- Eight OH-6D helicopters, six HU-1H helicopters and three LR-1 (MU-2) aircraft.

MSDF --- Eleven HSS-2B helicopters, one S-61A helicopter, four TC-90 instrument flight trainers and one KM-2 aircraft.

ASDF --- Four E-2C early warning aircraft, six C-130 transports, nine F-1 support fighters, three T-2 advanced trainers, two V-107 helicopters and one MU-2 aircraft.

*GSDF ground equipment

Eighty Model 74 tanks, 11 Model 73 APCs, 34 Model 75 155mm self-propelled howitzers, 219 84mm antitank weapons, nine Model 79 Ju-MAT missile units, and seven 203mm self-propelled howitzers.

*MSDF ships

One 4,500-ton DDG destroyer, three 2,900-ton DD destroyers, one 2,200-ton SSS submarine, two 440-ton MSC mine-sweepers, one 3,600-ton AS submarine tender, one 1,100-ton AGS survey ship and one 500-ton LSU landing ship. In addition two Takatsuki-class destroyers will be rehabilitated and modernized.

CSO: 4120

MILITARY

BASIC INDUSTRIES READY FOR ADVANCED WEAPONS SYSTEMS

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 6-8

[Text]

Japanese manufacturers have been upgrading their technical standards through production of weapons, vehicles, vessels, and aircraft for the Japanese Self-Defense Forces. Some of the Japanese defense products are said to be of world standards. But, certain materials or equipment must be imported for local assembly as local industries could not catch up with the rapid technical advance of manufacturers. Demand for sophisticated materials is usually small although advanced technology is required to manufacture, so basic industries could not afford to accept orders, a spokesman of Japan Ordnance Industry Association said. For example, Japan at present cannot produce high-quality heavy forged products for use with aircraft and tanks.

Since last year, however, material manufacturers have been making efforts to upgrade their technical standards and production capability in anticipation of increased demand.

Nittoku Metal Industry Co. will place its 6,300-ton screw press---the largest in the Orient---in 16-hour/day operation September 1 for forging special steel and titanium alloy materials. It can forge precision titanium alloys of up to 150 kilograms. The screw press, complete with three-dimensional measuring equipment, cost ¥1,000 million. Nittoku plans to invest an additional ¥1,000 million next year to modernize equipment to forge small materials.

Kobe Steel is finalizing plans to install an 8,000-ton forging press for manufacture of aluminum materials at its Nagoya plant by September 1981. The largest aluminum forging press in operation in Japan at the moment is of the 3,000-ton class. Kobe Steel will use the 8,000-ton press to manufacture pistons for aircraft and ships initially. The same press will be able to manufacture aluminum materials for armored vehicles.

Ishikawajima Precision Forging Co. has increased its production capacity by 20 percent with completion of a new plant in Tokyo. The company now has two plants---one for off-the-shelf products and the other for "special orders." The new plant will be used for increased production of parts for ASDF F-15 engines and other items for defense-related products.

Shinku Yakin, a specialized manufacturer of forged titanium materials, is negotiating with China for export of its products for use in a Chinese chemical plant.

The three major rolled aluminum material manufacturers---Furukawa Aluminum, Kobe Steel, and Sumitomo Light Metal Industries---are expected to soon begin experimental manufacture of aluminum alloy materials for aircraft. Forged, pressed, and other types of aluminum products will be studied for commercial production for use on civil transport aircraft and new alloy materials will be developed. The Society of Japanese Aerospace Companies (SJAC) will provide subsidies to help the firms. Research efforts are expected to be seen in the ASDF's MT-X advanced intermediate trainer project that will start in FY 1981.

Use of composite materials such as carbon fiber is envisaged for the MT-X trainer. Toray, Toho Rayon and other manufacturers of carbon fiber expanded production capacity from 20 tons to 30 tons during the last year. They now have a monthly production capacity of 35 tons.

As to processing carbon-fiber reinforced plastic (CFRP) materials, MELCO completed a plant in October for composite materials for space equipment. The plant can produce CFRP structural materials for defense products such as radar systems and weapons.

Advanced defense products require more and more electric and electronic equipment. Twenty to 25 percent of the orders from the Japanese Defense Agency are for this type of equipment. With the proposed BADGE-X project of the ASDF, manufacturers are actively trying to develop advanced electronic equipment. Fujitsu is developing a super high-speed computer that can process data 60 times faster than current general purpose computers.

CSO: 4120

MILITARY

ASDF, GSDF MAY ADOPT DIFFERENT NEW SAMS

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 8-9

[Text]

There is a possibility that the Air Self-Defense Force (ASDF) may adopt a new surface-to-air missile (SAM) different than that of the Ground Self-Defense Force (GSDF) because the two services' deployment of the same missile could lead to unification of some ASDF and GSDF SAM units or reduction of their personnel.

The ASDF is now studying what should be selected as a new long-range SAM to replace the Nike-J in a bid to request deployment of new SAMs from FY 1985. Overseas surveys about possible candidate missiles are scheduled in FY 1980 to follow general surveys in the United States and Europe in the previous fiscal year. The GSDF is certain to select the US Army/Raytheon Patriot as a successor to the medium-range Hawk. Its budget request for new SAM deployment is to come in FY 1982.

At present, the ASDF has six Air Defense Missile Groups, using Nike-Js, stationed in Iruma, Kasuga, Chitose, Gifu, Nara and Misawa air bases, while the GSDF has eight Anti-Aircraft Artillery Groups, using Hawks, in Chitose, Matsudo, Iizuka, Nayoro, Hachinohe, Nara, Takematsu and Aonogahara. The Nike-Js as long-range SAMs and the Hawk as medium-range SAMs are operated separately by the ASDF and the GSDF. If the Patriot is picked to replace both the Nike-J and the Hawk, however, some ASDF and GSDF missile units would be unified or abolished under the National Personnel Authority's recommendations for reduction of public service personnel. Examples are the 3rd ASDF Air Defense Missile Group and the 1st GSDF AAA Group in Chitose, the 5th ASDF and the 6th GSDF Gps in Nara, the 6th ASDF Gp in Misawa, and the 5th GSDF Gp in Hachinohe. Even if the two services insist on different missions using Patriot missiles---area defense for major cities, military bases and facilities for the ASDF and point defense for field and supply units for the GSDF, such unification or abolition would be inevitable.

In order to avoid this, the ASDF may possibly select another type rather than the Patriot. In preparations for the selection, the Technical R&D Institute of the Defense Agency has ordered Mitsubishi Heavy Industries to prepare a plan to upgrade the Nike-J's performance. The modified Nike-J is said designed to carry a Nike-J booster and a warhead of the US Navy/Hughes Phoenix long-range air-to-air missile (AAM). A digital computer will be installed to modernize ground acquisition and tracking radar systems. The modified version can overcome vulnerability to jamming, which is a major shortcoming of the Patriot. Such a large-scale modification may cost as much as development of a new missile. In case the modified Nike-J is adopted, the ASDF will replace the Nike-Js with the modified versions unlike the GSDF which has reequipped half of its Hawk units with improved Hawks.

Another possible candidate to succeed the Nike-J is the ground version of the Phoenix which is not operational yet. Its target range is 200 kilometers compared with 150 kilometers for the Nike-J and 75 kilometers for the Patriot. It is designed to fly at Mach 5 versus Mach 3.5 for the Nike-J and Mach 3.0 for the Patriot. These features indicate that the Phoenix version, if deployed in the United States, will become a strong candidate for the Nike-J replacement.

CSO: 4120

KEEN COMPETITION OVER GASTURBINES FOR NEW DDG

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 9-10

[Text]

Kawasaki Heavy Industries Ltd. (KHI) is actively promoting sales of a combined gasturbine and gasturbine (COGAG) powerplant consisting of two Rolls-Royce SM1A Marine Spey and two TM3B Olympus engines for the helicopter-carrying 4,500-ton DDG guided missile destroyer which the Maritime Self-Defense Force plans to begin construction of in FY 1981.

The MSDF has adopted a combined gasturbine or gasturbine (COGOG) powerplant consisting of the Marine Olympus and Tyne engines for its new 2,900-ton DD destroyer. The CODOG powerplant made up of the Olympus and a Japanese designed diesel has also been chosen for the 1,400-ton DE escort frigate.

Under a licensing agreement between Rolls-Royce and KHI, the Japanese company has been producing the Olympus and the Tyne for MSDF ships since 1977. It has produced 26 marine gasturbines for these types of ships.

KHI maintains that the combination of the small and the large gasturbines will better meet power requirements of the DDG class warship in various missions.

On the other hand, Ishikawajima-Harima Heavy Industries Co. Ltd. (IHI) is promoting sales of IM2000 marine gasturbine incorporating a General Electric design for the same DDG. IHI maintains that the powerplant consisting of gasturbines of same power outputs is increasingly being used for large-size warships of the world.

The MSDF and the Japanese Defense Agency are expected to make a final decision on the type of the gasturbine powerplant for the DDG toward the end of this year.

CSO: 4120

MHI ORDERS CCV PARTS FROM JAPAN AVIATION ELECTRONICS

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 p 10

[Text]

Japan Aviation Electronics Industry, Ltd. has received an order from MHI for the controller, system interface unit and the AOA transmitter of the control-configured vehicle (CCV), which MHI will fabricate under a contract from the TR&DI.

The CCV controller, the main electronic component of the CCV's digital fly-by-wire system (DFBW), is to compute data from various sensors of the CCV aircraft to improve its maneuverability. Three controllers will be installed on each aircraft.

Research and development of the CCV aircraft started in FY 1978 when the TR&DI awarded MHI a research contract. MHI plans to fabricate a research CCV aircraft by modifying a T-2 trainer.

MHI has awarded Japan Aviation Electronics the component order due to its experiences in design and fabrication of automatic flight control systems for both fixed and rotary wing aircraft, the company says. It also served as MHI's subcontractor in the FY 1975-78 TR&DI/MHI project for research into a fly-by-wire system, undertaking design and fabrication of its electronic components.

CSO: 4120

ECONOMIC

MITI MINISTER TANAKA'S VISIT TO SOUTHEAST ASIA REVIEWED

OW160147 Tokyo KYODO in English 0008 GMT 16 Sep 80

[Commentary by Ichiro Nakagawa]

[Text] Bangkok Sept 16 KYODO--Rokusuke Tanaka, Japanese minister of international trade and industry, returns to Tokyo from Southeast Asia Tuesday with a fresh resolve to take the initiative in solving Asian economic problems.

The Philippines, Malaysia, Burma and Thailand--the countries he has visited--all want Japan to extend more financial and technological assistance to tide over their energy problems, worsened by a series of oil shocks.

Tanaka brought with him to these countries what he calls a four-point doctrine along which cooperative relations between his country and Southeast Asian nations should develop.

The concept includes the Japanese initiative in solving the energy issues and promotion of smaller enterprises as a means to speed up independent economic development of these countries.

The proposal was received favorably by the leaders of each country, including Philippine President Ferdinand Marcos, Malaysian Prime Minister Hussein Onn, Burmese President Ne Win and Thai Prime Minister Prem Tinsulanon.

In Manila, Tanaka pledged to extend yen 50 billion export credits for building power plants--hydraulic, thermal and geothermal.

In Kuala Lumpur, he promised to give financial and technological aid for Malaysia's five-year economic development program starting next year.

Tanaka told Burmese leaders that their requests for Japan's restarting of trial oil drillings off the coast will be studied positively.

In Bangkok, Tanaka told Thai officials that export credits totalling yen 30 billion will be given to develop the power industry.

Tanaka's talks with these countries were not limited to economic and energy problems.

As a military officer during the last world war, he was sensitive to any reaction from them to the current Japanese efforts to expand defense forces.

The rapid Soviet military buildup in the Far East and its incursion into Afghanistan have alarmed Southeast Asia. The Japanese efforts were supported, not cautiously but rather positively.

"We are not worried about Japanese defense expansion," was the first comment from Southeast Asian leaders.

But Tanaka took the reaction with a grain of salt, saying: "The memories of the war appear still vivid among them."

Tanaka's tour was primarily aimed at further promoting economic relations with these four countries.

But he was entrusted with a job to pave the way for Prime Minister Zenko Suzuki's trip to the region early next year.

Customarily, almost all post-war Japanese prime ministers have visited the United States soon after they assumed power but this time Suzuki has picked Southeast Asia as his first overseas trip.

Invitations have already been extended to Suzuki from leaders in Southeast Asia who place ever-growing expectations on Japanese economic help.

"The problem is how soon Southeast Asian countries cease to regard Japan as a sugar daddy," a Japanese source enigmatically smiled.

CSO: 4120

JAPAN TO AID SOUTHEAST ASIAN COUNTRIES' FOOD PRESERVATION PROJECT

OW260225 Tokyo KYODO in English 0144 GMT 26 Aug 80

[Text] Tokyo, 26 Aug, KYODO--The government decided Tuesday to put up $236,000 for a research project on food preservation by irradiation to be participated in by southeast Asian countries.

A government spokesman said Indonesia and several other countries are expected to join the three-year project to be carried out on the basis of a regional agreement concluded by Japan and 11 other member countries of the International Atomic Energy Agency.

Japan will also provide technical assistance for the project as it has successfully developed technology for commercial use of irradiation to prevent potatoes from germinating, the spokesman said.

He said rice, onions, fruits and fishery products will be exposed to low-level radiation under the project to see if they can be preserved by irradiation.

Experts from Japan, Indonesia, India, Pakistan, South Korea, the Philippines and Sri Lanka are expected to meet at Jakarta on 2-3 September to discuss details of the project.

CSO: 4120

ECONOMIC

DESALINATION PLANT ON OKINAWA TO BE ESTABLISHED

OW260305 Tokyo KYODO in English 0256 GMT 26 Aug 80

[Text] Osaka, 26 Aug, KYODO--A desalination plant will be established on Oninawa shortly to help the southern island group cope with a chronic water shortage, a government state minister has disclosed.

Taro Nakayama, director general of the Prime Minister's office and the Okinawa Development Agency, said the plant, now under test operation at Chigasaki, Kanagawa Prefecture, uses vinylchloride under a reverse osmosis process.

He told western Japan business leaders Monday the government would seek budgetary appropriations from the finance ministry for the plant to be established next year.

Nakayama also disclosed to the businessmen government plans to hold down much-criticized public sector wages.

"I would like to present to the next extraordinary Diet session three bills on public servants, including one for a 10 percent cut in retirement allowances, which are much higher than the private sector," he said.

CSO: 4120

JAPAN, MEXICO AGREE ON JOINT STEEL PROJECTS

OW260121 Tokyo KYODO in English 0105 GMT 26 Aug 80

[Text] Tokyo, 26 Aug, KYODO--The Ministry of International Trade and Industry said Tuesday two Mexican-Japanese joint enterprises would be created in October in Mexico to push two of the three steel projects in the country.

The MITI said a Japanese Government mission reached basic agreement recently with the Mexican Government on the two projects--a steel pipe plant and a steel castings and forgings plant.

The mission and the Mexican Government, however, failed to reach agreement on the amount of a yen credit to be extended by Japan to help finance the Sicartsa steelworks expansion project, according to the ministry.

The Mexican side said international bids would be invited this autumn for the expansion project.

One of the two joint enterprises to be set up is to construct and operate a large-diameter steel pipe mill.

The enterprise will be capitalized at yen 13 billion, of which yen 5.2 billion will be provided by the Japanese interests, led by Sumitomo Metal Industries, Ltd., and yen 7.8 billion by Mexican interests.

The other company to be created is intended to construct and operate a steel castings and forgings plant.

This firm will have an initial paid-up capital of yen 17.5 billion, of which yen 5.8 billion will be put up by Japanese interests, led by Kobe Steel, Ltd., and yen 11.7 billion by Mexican interests.

Thirty percent of the Japanese investment will be borne by the governmental overseas economic cooperation fund, and the whole of the Mexican investment will be made with the aid of a loan from the governmental Export-Import Bank of Japan.

CSO: 4120

ECONOMIC

U.S. LABOR SECRETARY URGES COUNTRY TO CURB AUTO EXPORTS

OW270949 Tokyo KYODO in English 0753 GMT 27 Aug 80

[Text] Tokyo Aug 27 KYODO--U.S. Secretary of Labor Ray Marshall warned Wednesday of a rising tide of protectionism in the United States unless Japan curbed its auto exports and urged Japanese carmakers to invest money in locating assembly plants there to avoid frictions.

Describing the current Japan-U.S. auto trade dispute as "unusual and temporary" situation, he said, "The most important thing is to avoid unilateral action that will cause long-run difficulties" in the American market which he said is "saturated."

"It has political ground swell [as received] to prevent Toyota and other Japanese automakers to sell their cars in the long run," Marshall told newsmen at the U.S. Embassy shortly before departure for home after an 11-day visit here.

Noting possible increase in Japanese auto exports to the U.S. in the year ahead, he said, "We need to look at the long run as well as to the short run."

He said that the U.S. auto industry is undergoing a "difficult and expensive transition to the production of fuel-efficient vehicles, and the Japanese cooperation during this transition period is highly important to avoid long term structural problems which could be detrimental to both countries."

Marshall said that the transition will require U.S. automakers to spend dollar 8 billion and cited three potential difficulties--raising of money for the investment, creation of relative oversupply and tremendous political pressures (protectionism).

He said while here he met government and business leaders, including top management and labor representatives of Nissan Motor Co. but Nissan did not tell him whether it planned to expand its production units in the U.S.

Marshall said that he welcomes Japanese investment because it would make Japanese know more about the U.S. and Japanese management technique "has a lot to offer and is competitive."

He said that through talks with these people he could better understand the good labor-management relations and productivity in Japan which he said brought Japan's present economic growth in spite of its scarcity in natural resources.

Marshall said that average productivity level is higher in the U.S. than in Japan but the productivity growth is higher in Japan.

He said that he got [the] impression that Japanese industry cooperates closely with the government while the reverse is the case in the U.S. and said "We can learn a lot from Japan" in this regard.

He disclosed that Takashi Fukayama, parliamentary vice labor minister, will visit the U.S. in [the] near future for a first-hand study of the auty industry and its problems.

He also expressed the hope that Labor Minister Masayuki Fujio will visit the U.S. sometime next year for a "continuation of our cooperative exchange of information and experience."

CSO: 4120

ECONOMIC

NIPPON STEEL CONSIDERS DELEGATION FOR MOSCOW PIPELINE TALKS

OW270423 Tokyo KYODO in English 0354 GMT 27 Aug 80

[Text] Tokyo 27 Aug (KYODO)--In response to Soviet urging, Nippon Steel Corp is considering sending officials to Moscow early next month for talks on construction of a natural gas pipeline, sources said Wednesday.

But there appears little chance that the talks can produce firm contracts for shipment of large-diameter steel pipes and other equipment for the project, estimated to cost the equivalent of about dollar 10 billion, the sources added.

The Russians appear to be counting on more than dollar 3 billion in credits from the Export-Import Bank of Japan to finance purchases of steel and other products for the project.

But it appears unlikely the government will grant the credit line while the U.S. and Japanese economic sanctions against Moscow stay in force.

The Soviet Union, for its part, apparently is trying to diversify its sources of equipment and machinery supplies for the project for economic reasons.

Contruction of the 4,200-kilometer pipeline to carry natural gas from the Yamburg field in western Siberia to West Germany is included in the Soviet Union's new five-year economic development plan, starting next year.

The amount of large-diameter, high-pressure-resistant steel pipes needed for the project is estimated at 4 million tons.

Initially, the Soviet Union was planning to obtain trade credits from the West German Government and a syndicated loan from West German banks to finance the whole project, the sources said.

But Moscow is now having second thoughts on allowing the West Germans to monopolize sales of machinery and equipment needed for the project without competition from other countries, they said.

CSO: 4120

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ECONOMIC

RJ500 ENGINE DEVELOPMENT PROGRAM MAY BE ACCELERATED

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 pp 3, 4

[Text]

The development schedule of the RJ500 aero engine program now being promoted by Rolls-Royce Limited of the United Kingdom and three Japanese heavy industrial firms; Ishikawajima-Harima Heavy Industries (IHI), Kawasaki Heavy Industries (KHI) and Mitsubishi Heavy Industries (MHI) may be speeded up one to two years, Japanese industry sources reported last week.

The original engine program called for completion of development in 1987 with initial type certification in 1985.

Now there is a strong possibility that Boeing will advance its 737 reengine program one to two years so that the aircraft will fully meet US aircraft noise requirements after 1985.

General Electric - SNECMA is offering the CFM56-3 engine for the reengine program. The CFM-56-2 which was certificated last year at a maximum thrust of 24,000 lb was considered somewhat too big for the 737 program. But the CFM-56-3 which will be certificated at 22,000 lb will certainly meet the Boeing requirements and will become very competitive with the RJ500 which will have a maximum thrust of 20,000 lb. The development time schedule of the RJ500 will have to be reduced in order to compete with the GE-SNECMA engine, local industry leaders believe.

A Japanese mission including Managing Directors K. Ikeda of MHI, T. Yamada of KHI and K. Uchino of Civil Transport Development Corporation, which visited Seattle to talk with Boeing officials on Japan's Y-XX program last week reportedly discussed the 737 program.

Representatives of the British engine company and its Japanese partners are scheduled to meet this fall and matters concerning the advancement of development will be one of the most important items to be discussed at the meeting, Japanese industry sources say.

CSO: 4120

ECONOMIC

767 STRUCTURAL PARTS START 'TAKING OFF' FROM JAPAN

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 pp 4, 5

[Text]

Ceremonies commemorating the completion of the first 767 structural parts in Japan and subsequent shipment to Seattle were held August 8 at the Oye West plant of Mitsubishi Heavy Industries (MHI) in Nagoya. Present were some 200 representatives of the Japanese Government, including the Ministry of International Trade and Industry (MITI), aerospace industry, press, the U.S. Embassy and Boeing.

Spearheading the Seattle-bound deliveries were wing in-spar ribs manufactured by Kawasaki Heavy Industries (KHI), a member of the Civil Transport Development Corporation (CTDC) consortium, which left Nagoya port on July 21. Crown panels for fuselage sections built by KHI and MHI were shipped August 12. The first wing-to-body fairing assemblies are scheduled to arrive in Seattle from Fuji Heavy Industries (FHI) in November.

CTDC Chairman Kiyoshi Yotsumoto said at the ceremonies: "The 767 has been selling at a brisk pace with orders for a total of 288 airplanes, including options, received from 13 airlines to date. I am very proud that All Nippon Airways has ordered 40 of the aircraft since it attests to the Japanese airline's recognition of the YX/767 program as a national project."

Following congratulatory messages by Yoshihiro Sakamoto, Director, Aircraft & Ordnance Section, MITI, and Hidemasa Kimura, Prof. Emeritus of Nihon University, Dean Thornton, Vice President and 767 Div. Gen. Manager, Boeing Commercial Airplane Co., spoke and praised Japan for fulfilling its delivery schedule. The Boeing executive noted that Japan has substantially invested in facilities and personnel to make the milestone possible. He was confident that with such investment, Japan would be able to achieve its follow-on production rate successfully. Thornton reported that the 767 was doing better today than any other Boeing program.

CSO: 4120

STOL DEVELOPMENT PROJECT MAKING SMOOTH PROGRESS

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 pp 5, 6

[Text]

An interim report of the Council for Aeronautics, Electronics and other Advanced Technologies, an advisory body to the Science and Technology Agency, says the agency's project for developing a fan jet short take-off and landing (STOL) aircraft has been making smooth progress despite some delays. The council called for further budgetary assistance and close contacts with other agencies concerned.

The project, started in FY 1977, is to help develop Japanese technology for a low-noise STOL aircraft. Technical research has covered aerodynamic characteristics, noise levels of high lift devices, engine configuration, structure, and flight systems. Fabrication of an experimental aircraft started in FY '79 using a C-1 transport. The test plane adopts the upper surface blowing (USB) system using four FJR-710 engines.

The report recommends that future research focus on aerodynamic interference between jet engines, flaps and fuselage parts; increased aerodynamic performance of front flaps; and safety and reliability of fly-by-wire flight systems.

On performance of the experimental aircraft, it says take-off noise should be reduced by more than five decibels from 94 decibels as recommended by ICAO in order to comply with stricter noise requirements in the future.

The report also recommends improvement of air traffic controls, safety standards, airport systems and law be studied for operation of both STOL and other aircraft within limited air space. The agency should cooperate with other government offices in research into future air traffic demand, airport improvement, air space utilization, noise abatement requirements and other aspects to develop technological goals for STOL aircraft, it adds.

CSO: 4120

SHINKO ELECTRIC DEVELOPS JET ENGINE STARTER

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 p 6

[Text]

Shinko Electric Co. has developed a jet engine starter for civil aircraft for the first time in Japan. The ASA-240D starter, mounted on a medium-size truck, is priced at ¥39 million. The firm wants to sell some 10 units a year in Japan and Southeast Asia for large and medium aircraft, including A300s and Boeing 747s.

The ASA-240D, consisting of a diesel engine, a compressor, a control system and other parts, is a pneumatic starter designed to start auxiliary power units by pressured-air for actuating main engines. Its compressor needs no refueling, thus having little adverse effects on jet engines. Jet fuel will be saved as the starter actuates the auxiliary power unit on an aircraft without jet fuel consumption. It also features high reliability, simple maintenance and low noise characteristics.

The starter produces 240 pounds of compressed air per minute. The pressure is 32 to 42 pounds per square inch. It is 7.4 meters long, 2.18 meters wide and 3.38 meters high.

An experimental starter has already been tested at Haneda Airport in cooperation with Toa Domestic Airlines (TDA).

Although electric-powered starters are mainly used for military aircraft, Shinko Electric expects pneumatic starters to be used for civil aircraft increasingly in Japan. Japanese airports have about 30 pneumatic starters, all of which have been imported.

The company has so far produced ground support machines for airports, including battery-powered cars and forklift to handle containers. With these products and the new starters, it intends to enter overseas markets.

CSO: 4120

ECONOMIC

MAI TO COMPLETE MU300 ASSEMBLY PLANT AT SAN ANGELO

Tokyo JPE AVIATION REPORT-WEEKLY in English 27 Aug 80 p 7

[Text]

Mitsubishi Aircraft International Inc. (MAI), an American subsidiary of Mitsubishi Heavy Industries Ltd. (MHI) will shortly complete construction of a 6,400-square meter final assembly plant at San Angelo, Texas.

The MU300 twin-turbofan business aircraft is a successor to the MU-2 turboprop, the best selling Japanese civil aircraft ever. Approximately 650 MU-2s have been ordered to date.

MAI had two hangars at San Angelo with a total floor space of about 11,000 square meters before construction of additional facilities started. With completion of the new hangar for the MU300 assembly and additional warehouses, the floor space there will total about 18,000 square meters.

MU300 components which will be produced at MHI's Nagoya Aircraft Works will be shipped to MAI's San Angelo facilities for final assembly. MHI produced components for the first production MU300 was shipped from Nagoya for San Angelo at the end of July.

CSO: 4120

SECOND INTERIM RECOMMENDATIONS FOR Y-XX PROJECT ANNOUNCED

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 1-2

[Text]

The Policy Subcommittee of the Aircraft Division, Aircraft and Machinery Industry Council, recommended Japan should proceed with its own preliminary design work in FY 1981 for the Y-XX short-to-medium range advanced jetliner. In its second interim report submitted to MITI, the advisory body to MITI laid out guidelines for the Y-XX project which called for 1) preliminary design by Japanese industry in FY 1981; 2) establishment of research and test facilities for the project as well as other advanced aeronautical studies at the National Aerospace Laboratory (NAL) of the Science & Technology Agency, and 3) cost sharing for the development phase between the government and manufacturers. Financial risks in manufacture and sales should be taken by manufacturers, the report said.

The Y-XX project, the report said, will serve as an "operational" training of the Japanese aircraft industry for conduct on its own of an aircraft program from the design stage through manufacture and sales. Along with the Y-XX project, local industry should promote research and development of revolutionary technology that will provide the basis for a new-generation aircraft for the '90s, the report asserted.

In order to proceed with the Y-XX project the report recommended establishment of a central organization to coordinate industrial efforts. Along with the Y-XX project the report stressed Japan should promote the Anglo-Japanese RJ500 aero engine joint development program and the Boeing 767 jetliner joint development and production program.

To promote export of aerospace equipment, the report recommended establishment of a government credit system on a dollar basis. It also recommended a government loan system for import of aircraft developed with Japanese participation.

It was the first time that the designation "Y-XX" was officially used in a report of the Aircraft and Machinery Industry Council for an advanced airliner accommodating 130 - 150 passengers, and be able to operate from 2,000m runways which are being standardized for Japanese local airports.

The recommendation for the Japanese design efforts is significant as the council is to make another report pending results of recent talks with European and US manufacturers on promotion of joint market surveys on a nonbinding basis. The report is scheduled to be compiled by the end of August.

CSO: 4120

ECONOMIC

Y-XX JOINT SURVEY STATUS

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 2-3

[Text]

The Japanese government and aircraft industry are proceeding with the Y-XX project for international joint development of an advanced airliner. At present, Japan has received proposals including the Fokker F29 and the Airbus Industrie SA-1 for joint development as the Y-XX. Boeing has also shown interest in the Japanese project.

The Society of Japanese Aerospace Companies (SJAC) sent a survey mission to Europe between late April and early May this year. Three executives of KHI, FHI, and MHI visited Fokker and Airbus Industrie in late July for further studies. Top executives of the industry also visited Boeing in late August.

It has been learned that Japan will be required to make a government-guaranteed investment to join in Airbus Industrie's SA-1 project. The Fokker F29 project, on the other hand, has proven in fact to be a trination venture involving use of the Boeing 737 fuselage.

The Japanese government at the moment is suffering from financial difficulties and the aircraft industry is leaning toward exploring the Fokker F29 project. Relations between Fokker and Boeing, therefore, are regarded as the key to success of the F29 project.

In proceeding with the F29 project, Fokker has been trying to collaborate with Boeing and Airbus Industrie since the Dutch company lacked funds and a strong sales network to manufacture and sell the new airliner alone, industry leaders believe. Boeing, on the other hand, is busy with the Boeing 767 program in which Japan and Italy are involved, as well as the 757 and other programs. Japanese manufacturers doubt whether Boeing is ready and willing to joint in the F29 project. The F29 project will fail if Boeing does not participate, the three Japanese airframe manufacturers predict.

The world's aircraft industry is promoting various projects to develop economical airliners while airlines are not so enthusiastic in introducing new equipment under the current financial difficulties brought about by oil prices. It is generally thought that the airliner market will remain dull for the next several years.

Under such circumstances, some quarters in the Japanese aircraft industry advocate overall reassessment of the Y-XX project.

CSO: 4120

SPECIFICATIONS MODIFIED FOR STOL AIRCRAFT

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 p 3

[Text]

The National Aerospace Laboratory (NAL) recently announced some modifications on the specifications for the turbofan-powered experimental plane for research of short takeoff and landing (STOL). Modifications have been made as results of wind-tunnel tests using a scale model and other research since the specifications were drawn up last year. Modifications include:-

1. Relocation of inboard engines.

2. The angle of the wing's leading edges between engines and also between engines and fuselage, is to be modified to follow a similar configuration of the ASDF C-1 transport.

3. The angle of the horizontal stabilizers is to be increased to 10 degrees and the covering of the vertical tail plane is to be reinforced based on results of tail flutter tests.

4. For long-range operation, the takeoff weight is to be increased. The takeoff speed is set at 133 knots (93 knots in STOL mode) with a takeoff weight of 45 tons.

5. The maximum cruising speed is set at Mach 0.5 to avoid tail flutter.

6. The range is to be increased as takeoff weight is increased.

By the end of September this year, major design of the STOL experimental plane will be completed. Manufacturing specifications will be ready by the end of September 1981. Tests are under way for major components of the fly-by-wire control systems, heat-resistant components, cockpit mockup, engine and nacelle mockups. Wind-tunnel and simulation tests are also being promoted.

Manufacture of the high-lift devices, control systems, modified portions of the C-1 fuselage and two FJR turbofan engines is under way. In FY 1981, center and rear fuselages, horizontal stabilizers, undercarriages and other parts common with the C-1 will be fabricated. FJR engines will be flight tested in 1981.

CSO: 4120

MITI ANNOUNCES ITS 'VISION ON SPACE INDUSTRY'

Tokyo JPE AVIATION REPORT-WEEKLY in English 3 Sep 80 pp 4-5

[Text]

The Ministry of International Trade & Industry (MITI) has announced a gist of its "Vision on Space Industry" that called for ambitious Japanese efforts in the '80s for development of the aero space industry. MITI termed the space industry "a new frontier industry that will technically lead others instead of the defense industry."

The three major projects laid out in MITI's "Vision" include 1) establishment of the Japan Rocket Mfg. Co. (tentative name) in FY 1982 by joint investment of the government and private firms; 2) development of a large space shuttle in collaboration with NASA; and 3) establishment of an international joint space development agency among Asian nations--a counterpart of ESA.

A space industry council, an advisory body to the Director General of Machinery and Information Industry Bureau, MITI, will be established in September this year. With the "Vision" as its starting point, the proposed council will prepare a report by the end of March 1981. The report will be examined by the Aircraft and Machinery Industry Council and a final recommendation to MITI will be made in the fall of 1981. A survey mission will be sent to Europe and the US in May 1981 to study the status of the space industry in those areas.

The Japanese space industry, MITI stated, is dependent on government orders financially and on foreign countries technically. There are strict regulations covering export of Japanese space-related products and only a few companies are specialized in the space industry. In the near future, MITI predicts, demands to be placed on the space industry will rise tremendously for both government and commercial uses with expansion of satellite communications and broadcasting networks and progress in scientific research through use of space equipment such as the space shuttle. Japan will be able to upgrade its technical standards and to develop new technology through its efforts in the space industry, MITI believes.

MITI pointed out that Japanese efforts should be consolidated under a single organization such as the National Space Development Agency (NASDA). At present NASDA is responsible only for practical satellites and rockets while the Institute of Space and Aeronautical Science, University of Tokyo, is in charge of scientific observation satellites and rockets. By consolidating these two space organizations Japan will be able to strengthen its position in the international field, MITI said.

There are about 65 companies engaged in Japanese space efforts which cover ten industrial areas, including steel, chemistry, electricity, general machinery, transport machinery, precision equipment, and information. MITI wants to establish the Japan Rocket Mfg. Co. with joint investment of the government and these companies to provide a unified effort to produce satellites and rockets. One case in point, MITI stated, is Nihon Aeroplane Mfg. Co. (NAMCO) that was established in 1959 for manufacture of the YS-11 turboprop airliner. The proposed rocket company, MITI pointed out, would be superior since it would have its own production facilities.

Space development programs will be intensified and become more complicated so that international collaboration will become necessary. NASA plans to develop a space shuttle which will be larger than the present one. Japan, through the Japan Rocket Mfg. Co., should join with NASA for development of a large space shuttle as well as a powered satellite throughout the '80s, MITI stressed.

Japan will be able to contribute to Asian nations in the area of space development by taking the initiative in creating an Asian Space Agency jointly with Asian nations. The 10-nation European Space Agency (ESA), established in 1974, is achieving remarkable results, MITI added.

CSO: 4120

BRIEFS

BUSINESS TIES WITH PRC--Tokyo, 12 Aug--Daiwa Securities Co said Tuesday it has signed a business affiliation agreement with China for the promotion of Japan-China joint ventures. The agreement with the Shanghai Trust and Investment Corporation ad the Bank of China's Tianjin Branch called for cooperation in China's procurement of overseas funds and interexchange of trainees. Tokai Bank Ltd. also disclosed Tuesday it has concluded a business affiliation contract with the China International Trust and Investment Corporation. Under the contract, the two firms will introduce to one another interests wishing to launch joint ventures, exchange technology and start trade. They will also cooperate in raising funds for promoting these activities. [Text] [OW141355 Tokyo KYODO in English 1038 GMT 12 Aug 80 OW]

IMPORTS FROM BRAZIL--Sao Paulo, 3 Aug--A government sponsored Japanese trade mission has pledged to import $730 million worth of goods from Brazil during its 13-day stay in the South American country. Seiki Tozaki, head of the mission, told newsmen Friday, the mission has concluded a $490 million contract already and the remaining $240 million will be contracted for within the next 6 months. Tozaki, who is President of C. Itoh and Co., also said that the mission promised Brazil to double the imports of fish and agreed to purchase 300,000 tons of soybeans and soybean cake a year over the next 3 years. [OW050539 Tokyo KYODO in English 0538 GMT 3 Aug 80 OW]

PRC AUTO PARTS CENTER--Tokyo, 4 Aug--Isuzu Motors Ltd., a leading truck builder, said Monday it opened a parts supply center in Nanjing, eastern China, the same day. It said an opening ceremony, held at its site Monday, was attended by Isuzu President Toshio Okamoto and Cheng Jixian, manager of the China National Machinery Import and Export Corporation. Isuzu said the Nanjing Parts Center will supply spare parts for its trucks on Chinese roads. Some 1,000 items of Isuzu trucks, worth about yen 30 million, will be stored in a 1,500-square meter warehouse at the center. The Chinese corporation will be in charge of the center with the help of two Isuzu officials, it added. Isuzu is the fourth Japanese motor vehicle manufacturer to open a parts supply center in China after Mitsubishi Motors Corp., Hino Motors Ltd. and Toyota Motor Co. [Text] [Tokyo KYODO in English 1035 GMT 4 Aug 80 OW]

POSTAL MINISTER PRC VISIT--Tokyo, 5 Aug--Ichiro Yamanouchi, minister of posts and telecommunications, will visit China later this month for official talks. The visit is at the invitation of his Chinese counterpart, Wang Zigang, and will last 1 week from 29 August. Yamanouchi told reporters that during his visit he hopes to explore ways of furthering Sino-Japanese cooperation in the posts and telecommunications fields. It will be the first time in 7 years that a Japanese minister of posts and telecommunications will visit China since 1973 when Chuji Kuno, then postal services minister, attended a ceremony to sign an accord to open the Sino-Japanese undersea cables. Earlier, Yamanouchi had visited China twice last year as a member of Japanese engineering mission to promote friendship and to cooperate in railway and ports and harbor aspects. [Text] [Tokyo KYODO in English 0533 GMT 5 Aug 80 OW]

IRAQ OIL SUPPLY PROMISE--Tokyo, 5 Aug--Iraq has expressed readiness to favorable consider Japan's request for increased crude oil supplies, the Ministry of International Trade and Industry (MITI) said Tuesday. A MITI official said that when Naohiro Amaya, MITI vice minister for international affairs, visited Baghdad in June, he asked the Iraqi Government to increase its supplies from 7 million to 10 million tons a year. The official said Iraq has just replied to the request, but no agreement has been reached as yet on the price or exact volume. He said this would be discussed when Iraqi Oil Minister Tayih 'Abd al-Karim visits Japan this autumn. [Text] [Tokyo KYODO in English 0427 GMT 5 Aug 80 OW]

PRC DOCKYARD CONTRACT--Tokyo, 19 Aug, KYODO--Mitsubishi Heavy Industries Ltd. Tuesday announced it had signed a 2-year technological cooperation contract with a Chinese dockyard. Under the arrangement with the Jiangnan dockyard in Shanghai of the China Shipbuilding Corporation, Mitsubishi will send a total of 900 experts to advise on the improvement of dockyard equipment and to provide guidance in advanced management techniques. Mitsubishi will also train Chinese personnel at its shipyards in Japan. The Jiangnan dockyard has 7 building berths, 3 docks and some 13,000 workers. [Text] [OW191359 Tokyo KYODO in English 0722 GMT 19 Aug 80 OW]

OIL PROSPECTING IN U.S.--Tokyo, 17 Aug, KYODO--Idemitsu Kosan Co., a major oil refiner-distributor, has decided to branch out into oil development in the United States, a Tokyo daily reported Sunday. Idemitsu Oil Development Co., an Idemitsu subsidiary, will shortly start prospecting for on-shore and off-shore oil in the U.S. mainland, the MAINICHI SHIMBUN said. Idemitsu is the first Japanese oil distributor to begin oil exploration in the U.S. Mitsubishi Corp. and C. Itoh and Co., both major trading houses, Suntory Ltd. a major whisky distiller, and Wanbishi Sangyo, an oil product dealer, are in the oil business, mainly prospecting, in the U.S. mainland. The U.S. is scheduled to lift price controls on domestically-produced oil from October of 1981 in a bid to stimulate development of domestic oil resources and to promote oil conservation. Therefore, recently-neglected domestic oil wells are coming into the spotlight again and new drillings have begun now that imported crude prices exceed the $30-a-barrel mark. The daily quoted as an Idemitsu Director as saying that, if the development is successful, Idemitsu would sell locally or exchange for Middle East oil. Since the U.S. prohibits exporting domestically-produced oil. [Text] [Tokyo KYODO in English 0620 GMT 17 Aug 80 OW]

THERMAL POWER PLANT PROJECT--Osaka, 13 Aug--Four electric power companies have agreed on a joint construction of a coal-burning thermal power plant equipped with two 1 million-kilowatt generators in Noto Peninsula in Ishikawa Prefecture, informed sources here said Wednesday. The companies involved in the project are Kansai, Chubu and Hokuriku Electric Power Companies and Electric Power Development Co. The sources said these companies would discuss further the establishment of a joint firm that would undertake the project to be completed in about 5 years' time at a total cost of some yen 500 billion. Under the present plan, the sources said, the power plant will be constructed on a 100-hectare reclaimed lot off the northeastern coast of the Noto Peninsula together with coal unloading facilities. [OW141355 Tokyo KYODO in English 1058 GMT 13 Aug 80 OW]

PRC JOINT TAXI ENTERPRISE--Tokyo, 21 Aug, KYODO--A southern Chinese municipality and two private enterprises--one Japanese business and the other in Hong Kong--are starting a joint taxicab business later in the year, in October at the earliest. Representatives of the Fushan Municipal Department of Communications, the Tokyo-based Japan Automobile Sales Co., a major used car dealer, and Hong Kong's China Communication (Motors) Trading and Development Corp. signed a joint venture agreement at Fushan, near Guangzhou, earlier in the month. This was revealed Thursday by Hitoshi Nagaoka, president of Kyokko Co. of Tokyo, Japan representative of the Hong Kong partner. Nagaoka said this would be the first joint taxicab service business with foreign interests in China. He said Japan Automobile Sales Co. would furnish initially 50 new air-conditioned autos--40 cars and 10 microbuses--for the joint venture. The Fushan Communications Department will provide land and a repair factory for the joint undertaking. Drivers will be secured by the Chinese side. The Hong Kong partner will perform the sales and promotion business. [OW211139 Tokyo KYODO in English 0427 GMT 21 Aug 80 OW]

BEIJING PAINT PRODUCTION PLANT--Osaka, 21 Aug, KYODO--Nippon Paint Co. said Thursday that it has exported a semi-finished paint product plant worth $1.23 million to the Beijing Municipal Chemical Industry Bureau under the production sharing system. The system, the first of its kind for the Japanese paint industry, has been applied in many cases recently for Japanese chemical plant exports due to the deteriorating foreign currency situation in China. Under the agreement, the Japanese firm will deliver the plant with monthly production capacity of 450 tons of alkyd resin varnish, a semifinished paint product for use in construction and shipbuilding, to a paint factory run by the Beijing Municipality through its affiliate in Hong Kong. At the same time, Nippon Paint will send engineers to the factory for technical guidance in operating the plant, which will be completed in late October and start production in early December after installing equipment and test operations. The Nippon Paints affiliate in Hong Kong will take delivery of 650 tons of the semifinished product a year or 40 percent of the total production from the factory for the plant payment. The semifinished product will be put into finished products by Nippon Paint's six affiliates for sale in southeast Asia. [Tokyo KYODO in English 0358 GMT 21 Aug 80 OW]

FERTILIZER EXPORTS DOWN--Tokyo, 20 Aug, KYODO--Japanese exports of ammonium sulfate in the year July 1979 to June 1980 totaled 697,561 tons, a drop of 6.4 percent from the previous year, the Japan Urea and Ammonium Sulphate Industry Association reports. Urea exports amounted to 939,428 tons, down 20.4 percent compared with the preceding year. The association said main reason of export decrease of the two products was that importing countries controlled their purchases because Japanese fertilizer makers raised export prices on the ground of rising prices of naptha and other raw materials. By nation, exports of ammonium sulfate to China totaled 390,898 tons; the Philippines, 70,000 tons; Thailand, 66,000 tons; New Zealand, 26,000 tons; and Nepal, 3,000 tons. Urea exports to China came to 817,700 tons; Burma, 30,000 tons; Pakistan, 29,000 tons; the Philippines, 13,000 tons; New Zealand, 8,800 tons; and Nepal, 7,000 tons. [Text] [Tokyo KYODO in English 0524 GMT 20 Aug 80 OW]

NTT RECORD PROFIT--Tokyo Aug 28 KYODO--The Nippon Telegraph and Telephone Public Corporation earned a record profit of yen 452.9 billion in the fiscal 1979 year. This was revealed in a statement of accounts for the year submitted Thursday by the government-financed corporation to Posts and Telecommunications Minister Ichiro Yamanouchi. Incomes totaled yen 3,855.6 billion, up 6.4 percent over the previous year, and expenditures yen 3,402.7 billion, up 5.3 percent. Telephone fees accounted for 88 percent of the total income, with yen 3,395 billion. Telephone fee collections increased yen 172.5 billion over the 1978 fiscal year. In contrast, the telegraphic and data communications businesses showed deficits. During the 1979 fiscal year 1,350,000 telephones were newly installed and 110 new telephone exchanges were built. The corporation predicts the favorable business trend will continue three more years. The discount for night phone calls will be increased, starting November 27. [Text] [OW280946 Tokyo KYODO in English 0855 GMT 28 Aug 80]

TOYOTA-FORD JOINT VENTURE--Tokyo Aug 28 KYODO--Daihatsu Motor Co., maker of smaller-size cars, may join in a joint venture planned by Toyoto Motor Co. and Ford Motor Co., Toyota President Eiji Toyoda said Thursday. His statement was taken to show Toyota's readiness to help the second-ranked American automaker in producing cars of the 1,000-c.c. class in piston displacement. Industry sources said Ford sought Toyota's cooperation to challenge General Motors' "S"-cars with piston displacement of between 1,000 and 1,300 c.c. Toyoda said a Toyota official might visit the U.S. shortly to start formal negotiations with Ford about the planned undertaking. Daihatsu is operating within the Toyota group. [Text] [OW281221 Tokyo KYODO in English 1214 GMT 28 Aug 80]

AID TO NEPAL--Tokyo Aug 22 KYODO--Japan will extend an aid in grant totaling yen 2,000 million to Nepal to be used for construction of power transmission and other public facilities, the Foreign Ministry announced Friday. Notes to this effect were exchanged in Katmandu Friday by Ambassador Minao Tsuchiya and Nepalese Finance Minister Goraksha Bahadur Nhuchhe Pradhan. Of the Japanese aid, yen 1,500 million will be used for the improvement and expansion of the electric power transmission and distribution system in the Katmandu area, and the remaining yen 500 million for purchasing of materials needed for the implementation of public facilities construction project, including roads, officials said. [OW251051 Tokyo KYODO in English 0850 GMT 22 Aug 80]

OIL AGREEMENT WITH CANADA--Tokyo Aug 22 KYODO--A basic agreement was reached in Tokyo Friday between the Japan National Oil Corporation and Dome Petroleum, Ltd. of Canada on the joint development of oil resources in the frigid Beaufort Sea. According to the agreement, the Japanese will advance a sum of 400 million Canadian dollars (approximately yen 76,500 million) to finance exploration in the area which Dome will start this year and continue until 1984. The Canadians will pay back this loan by supplying Japan with crude oil from the oil fields developed in this sea. The Japanese will also extend 10 to 25 percent of the expenses necessary for the development of new oil fields after the initial exploration period and, in return, acquire the right to purchase crude oil pumped from these oil fields. The Beaufort Sea, which is above the Arctic Circle and near the border between Canada and Alaska, is believed to have oil reserves so rich that it has been called "another Saudi Arabia." The oil corporation estimates that the area contains 36 billion barrels of crude oil and 340 trillion cubic feet of natural gas. [OW251051 Tokyo KYODO in English 1224 GMT 22 Aug 80]

TOKYO TRADE CONFERENCE--Tokyo Aug 25 KYODO--Fifteen ranking government trade officials from 14 countries in Asia and the Pacific Monday began a five-day study on how they can promote their exports to Japan. On the opening day, they were briefed on the functions and activities of the Japan External Trade Organization (JETRO), a semiofficial Japanese trade promoting agency, the structure of Japan's trade and the marketing in Japan of marine products and canned foods. China, Fiji, Maldives and Samoa are taking part for the first time in the workshop, being held at JETRO's conference room in Tokyo. Being held for the second time, it is cosponsored by JETRO, the UN Development Program (UNDP), the Economic and Social Commission for Asia and the Pacific (ESCAP) and the International Trade Center, an offshoot of the Conference on Trade and Development (UNCTAD) and the General Agreement on Tariffs and Trade (GATT). Except for India and Indonesia, Japan has trade surpluses with all the nations in the region. [OW251051 Tokyo KYODO in English 0817 GMT 25 Aug 80 OW]

EXPORT LETTERS OF CREDIT--Tokyo 3 Sep KYODO--Export letters of credit (l/c's) received by Japan in August totaled dollar 7,081 million, up 11.7 percent over the same month in 1979, the Finance Ministry and the Bank of Japan jointly reported Wednesday. Exports of electric machinery to the Middle East and Europe rose 30 percent, while automobiles, general machinery and textile products shipments increased 10 percent or more. But steel and chemical products exports slowed. Exports to the United States advanced only 2 percent because of slow growth in auto and steel exports. After seasonal adjustments, l/c's received by Japan stood at dollar 7,495 million, up 3.1 percent from July. It was the second largest figure reported, topped only by dollar 7,680 million last February. [Text] [Tokyo KYODO in English 0307 GMT 3 Sep 80 OW]

AID TO MALI--Tokyo, 26 Aug (KYODO)--Japan will extend Mali an aid in grant totaling yen 500 million for improvement of transportation capacity, the Foreign Ministry announced Tuesday. Japan gave similar aid totaling yen 400 million in 1977, yen 500 million in 1978 and yen 400 million in 1979, officials said. [Text] [Tokyo KYODO in English 0824 GMT 26 Aug 80 OW]

RICE FOR PERU--Tokyo, 29 Aug (KYODO)--Japan has agreed to export 10,000 tons of rice on a deferred payment basis to Peru, ravaged by food shortages, according to the food agency. The polished rice is to be shipped in September at yen 103,000 a ton. The payment will be made in installments for 20 years after a deferred period of 10 years. The interest rates will be 2 percent per annum during the deferred period and 3 percent thereafter. [Text] [Tokyo KYODO in English 0121 GMT 29 Aug 80 OW]

BAHRAIN MITSUBISHI SUBSIDIARY--Tokyo 9 Sep KYODO--Mitsubishi Corp. said Tuesday a wholly owned subsidiary would be set up at Bahrain on 1 October. Bahrain has fast grown as a financial center in the midEast area. The subsidiary will coordinate Mitsubishi's operations in 11 mid-East countries, including Saudi Arabia, Iraq, Kuwait and Iran, Mitsubishi said. [Text] [OW091357 Tokyo KYODO in English 1238 GMT 9 Sep 80 OW]

AID TO INDIA--Tokyo, 27 Aug (KYODO)--Japan will give India grant aid up to yen 1,500 million for improving the social environment there, the Foreign Ministry announced today. It said notes to this effect were exchanged in New Delhi Tuesday between Japanese Ambassador Masao Kanazawa and R.N. Malhotra, secretary to the Indian Government. The aid would be used by India for securing small steel bars for social environment improvement projects, including construction of a hospital and houses for low-income people, the ministry added. [Text] [Tokyo KYODO in English 0319 GMT 27 Aug 80 OW]

AID TO KAMPUCHEA--Tokyo, 27 Aug (KYODO)--The Japan Red Cross decided Wednesday to send yen 230 million worth of relief supplies to Cambodia, Red Cross officials said. The Japanese society so far has sent foodstuffs and refugee relief supplies worth yen 18 million to Cambodia, but this will be its first material donation on such a large scale. Officials said the supplies include medical equipment, 6 million vitamine capsules, 2 trucks, crockery and 30,000 articles of clothing. They said the goods are scheduled leave Yokohama on a freighter of Panamanian registry on 3 September and should arrive at the Cambodian port of Kompong Som in mid-September. [Text] [Tokyo KYODO in English 0826 GMT 27 Aug 80 OW]

PETROCHEMICAL PLANTS FOR TAIWAN--Tokyo, 28 Aug (KYODO)--Chiyoda Chemical Engineering and Construction Co, and Mitsui and Co, jointly announced Thursday the receipt of an order for a purified terephthalic acid (PTA) plant from China American Petrochemical Co of Taiwan. The order, valued at about yen 22 billion ($100 million), also calls for the Japanese firms to undertake construction of the plant at the No 4 petrochemical complex in Lin-Yuan, south of Kaohsiung, southern Taiwan. The plant with an annual capacity of 150,000 tons will go into commercial operation in early 1983, the companies said. PTA is a material of polyester fibers. It is the second PTA plant to be exported to China American Petrochemical, a Taipei-based U.S.-Taiwan joint company, by Chiyoda and Mitsui. [Text] [Tokyo KYODO in English 0550 GMT 28 Aug 80 OW]

PRC FINANCIAL TIEUP--Osaka, 28 Aug (KYODO)--Taiyo Kobe Bank announced Thursday the business tieup with three Chinese banking institutions for financial cooperation. It was the first time that a Japanese bank has signed a tieup with three Chinese banking institutions. The three Chinese institutions involved are the Bank of China, China International Trust and Investment Corp, and Tianjin International Trust and Investment Corp. The agreement calls for the partners to act as intermediaries for joint ventures, production sharing, leasing and technical interchange between Japan and China. It also calls for financial cooperation in fund raising and operation when necessary as well as information exchange on international financial situations and personnel exchange. [Text] [Tokyo KYODO in English 0225 GMT 28 Aug 80 OW]

AID TO ZAIRE--Tokyo Sept 8 KYODO--Japan will provide Zaire with a total of yen 1,000 million in grant aid for improving the transport capacity for agricultural produce, the foreign ministry announced Monday. Diplomatic notes on the aid were exchanged in Kinshasa over the weekend between Toshio Oshima, Japanese ambassador to Zaire, and Dulia Yubasa Mkanga Lengema, state secretary for International Cooperation of Zaire. [Text] [OW081453 Tokyo KYODO in English 0616 GMT 8 Sep 80]

JAPANESE COMPUTER CHALLENGES IBM'S--Tokyo Sept 9 KYODO--Nippon Electric Co. (NEC) announced Tuesday that what is claimed to be the world's largest and quickest computer system, developed jointly by it and its joint venture with Toshiba Corp., went on sale the same day. Dubbed the ACOS System 1000, the giant computer has a much larger memory capacity and higher processing speed than the existing mammoth computers of International Business Machines Corp., NEC claimed. It is believed that the new product will be pitted against a new high-performance computer system--H series--which IBM is expected to put on sale next spring. NEC said the actual shipment of the new computer, put on sale Tuesday, would start in October next year. The rental for model 1 will be about yen 30 million and that for model 2 about yen 43 million. The company hoped that about 80 units of the new product would be sold over 5 years. [Text] [OW091147 Tokyo KYODO in English 1140 GMT 9 Sep 80]

PUBLIC INVESTMENT TARGET LOWERED--Tokyo Sept 5 KYODO--The government intends to revise downward yen 240 trillion (about dollar 1.1 trillion) in targeted public investments in the seven-year (fiscal 1979-85) economic and social development program, government sources said Friday. The sources said the figure has turned out to be unrealistically large as a result of the second international oil crisis of 1979, and the government's shelving of its plan to institute a general consumption tax from fiscal 1980 as a Japanese version of Europe's value-added tax (VAT). According to the sources, the government will seek the opinion of the Economic Council, an advisory body to the prime minister, on the proposed revision of the public investment target at its meeting late this month. The sources said the government hopes to reach a conclusion on the proposed revision by the end of this year. [Text] [OW050319 Tokyo KYODO in English 0305 GMT 5 Sep 80]

CSO: 4120

SCIENCE AND TECHNOLOGY

SUMITOMO COAL GASIFICATION METHOD OUTLINED

Tokyo SUMITOMO-SHIKI SEKITAN GASU-KA HO [SUMITOMO COAL GASIFICATION METHOD] in Japanese Aug 79 pp 1-4

[Article by Sumitomo Metal Industries, Ltd]

[Text] 1. Preface

Oil which was deemed the key energy source in the conventional high growth period is losing its position as the primary energy source due to the sharp price increase as seen when crude oil hit $20 and the fear of reduced supply capacity. In place of this, utilization of coal resources is becoming extensively appreciated once more. Also, in our country, COM, gasification and liquefaction are considered feasible and R&D efforts are being promoted in various fields with enthusiasm.

In our company, since last year, we have also pushed various investigations pertaining to gasification and liquefaction of coal and COM. As far as liquefaction is concerned, we have been awarded a contract by the Agency of Industrial Science and Technology of MITI starting from last fiscal year to conduct research in the solvent treatment liquefaction method. On the other hand, in respect to the coal gasification methods, we have aimed at the iron bath gasification method which is an application of iron manufacture technology. Since June last year, we have zealously conducted basic experiments at our central technical laboratory. As a result, we feel the practicalization feasible, and have decided to install a full-scale pilot plant on the grounds of the Kajima Iron Foundry. Incidentally, this process was developed jointly with Sumitomo Heavy Industries, Ltd.

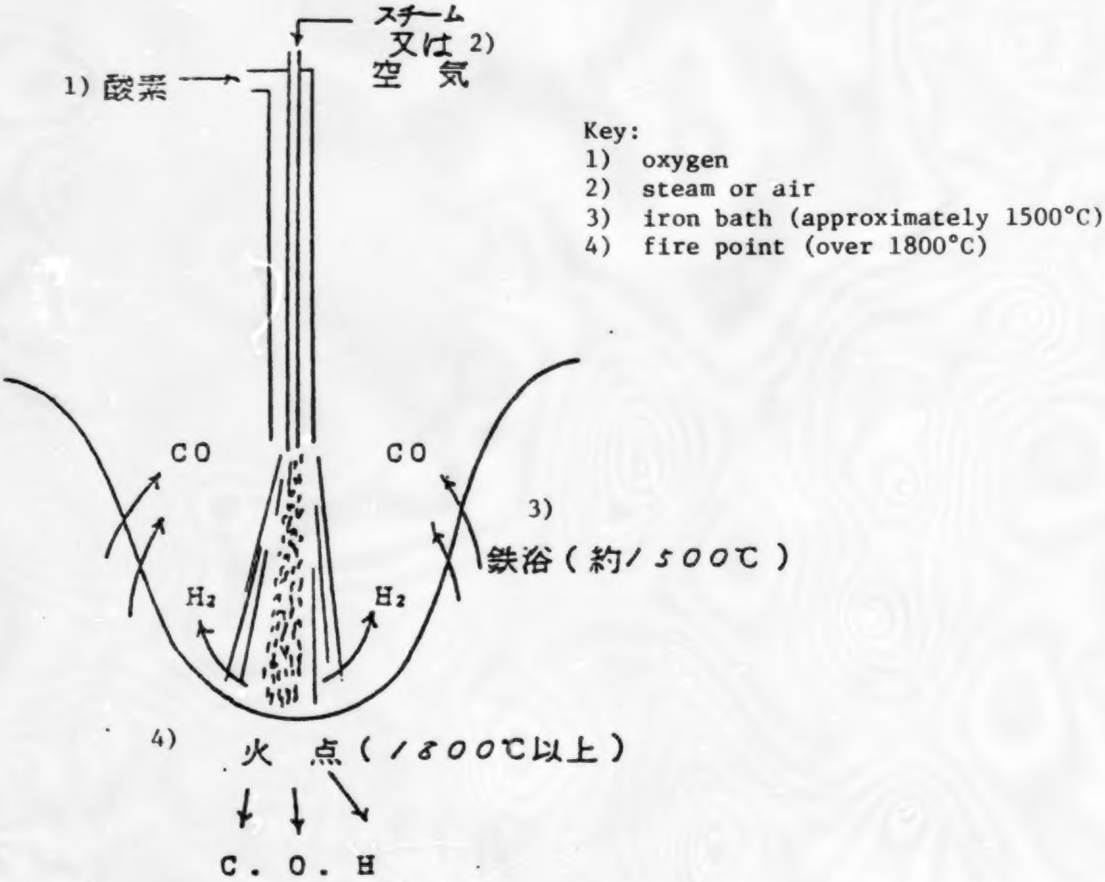
2. Principle of Gasification

Basically, coal is fed into an iron bath while blowing oxygen into the iron bath to induce a decarbonization reaction ($C + \frac{1}{2}O_2 = CO$). From the aspect of heat balance, it is an exothermic reaction. Therefore heat is controlled by simultaneously adding steam.

Decarbonization reaction: $C + \frac{1}{2}O_2 = CO$ (+ 32400 Kcal/Kmol)

Thermal decomposition of coal: $C \cdot H \rightarrow C$ (to iron bath) + H_2 (-5980 Kcal/Kmol)

Water gas reaction: $C + H_2O = CO + H_2$ (-25,400 Kcal/Kmol)



Key:
1) oxygen
2) steam or air
3) iron bath (approximately 1500°C)
4) fire point (over 1800°C)

3. Characteristics of Sumitomo Gasification Method

Convertor steel manufacture method technology was applied to this process, characterized in that efficient coal gasification is achieved by blowing coal dust (3mm-200 mesh) and steam with oxygen from a special lance into the direction of a high temperature fire point of approximately 2000°C produced in the center of the iron bath of approximately 1500°C. The iron bath used in this process serves as a heat medium necessary for gasification as well as a buffer which dissolves and absorbs C in coal.

On the other hand, ash content in the coal floats up to the surface of the iron bath after being melted and is discharged as slag. Also, sulfur content, although it once dissolved in the iron bath, reacts with CaO in the slag to turn into CaS and forms slag. (A small amount of CaO is added to promote this desulfurization reaction).

Consequently, the present process has the following merits:

1. There is no restriction in regard to the types of coal to be used.

2. The level of effective ingredients (CO and H_2) is high while hazardous ingredients such as SO_2, H_2S, HCN and NH_3 are extremely few in the produced gas.

3. The structure of the gasification furnace is simple and can be easily made on a large-scale.

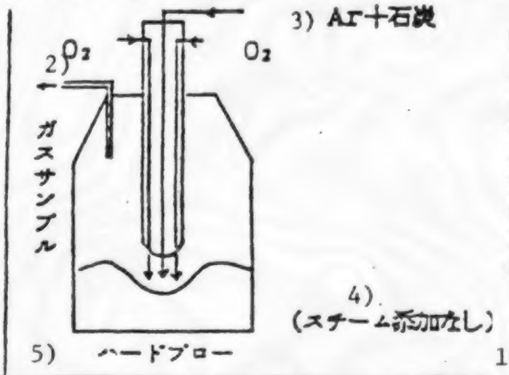
4. Loss of coal is small (over 98 percent gasification yield).

5. Operation is easy.

6. The produced gas can be used as raw material gas for chemical synthesis and for H_2 manufacture besides as a general fuel.

4. Basic Experimental Results

(Results of experiments with a 2 ton converter at Central Technical Lab.)

1) 添加方法		 3) Ar+石炭 2) O₂ O₂ ガスサンプル 4) (スチーム添加なし) 5) ハードブロー
6) ガス組成	CO	52〜60%
	H_2	24〜30%
	CO_2	1.〜 24%
	H_2S	<1.6 PPM
温 7) 度		9) 1500℃略々維持
鉄浴中C 8)		10) 0.5〜1%で略々維持

Key:
1) feeding method
2) gas sample
3) AR + coal
4) steam not added
5) hard blow
6) gas composition
7) temperature
8) C in iron bath
9) 1500°C practically maintained
10) practically maintained to 0.5-1 percent

5. An Example of Material Balance

(1) Coal Used: Highly Volatile Noncaking Coal

inherent moisture	29 percent
ash content	9.6 percent
volatile fraction	34.6 percent
fixed carbon	529 percent
carbon (d.a.f.)	88.7 percent
hydrogen (d.a.f.)	5.5 percent
oxygen (d.a.f.)	28 percent
nitrogen (d.a.f.)	21 percent
sulfur (d.a.f.)	0.9 percent
calorific value	7,000-7,300 kcal/kg

(2) Material Used per 1 Ton Coal

(Figures in the round bracket indicate the values when coal is pneumatically transported)

amount of oxygen blown	610Nm^3	(590)
steam	180kg	(170)
amount of gas produced	2270Nm^3	(2370Nm^3)
calorific value of produced gas	2750Kcal/Nm^3	(2610)
composition of produced gas	CO 61 vol percent	(58)
	CO_2 3 " "	(3)
	H_2 35 " "	(33)
	N_2 < 1 " "	(6)

(The above numerals are values calculated assuming the coal loss to be 5 percent)

(3) Coal Treating Capacity

per 1 ton of iron bath: 250-350 kg/h

8940
CSO: 8129/1568 END

JPRS 76660

20 October 1980

Japan Report

No. 108

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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20 October 1980

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No. 108

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POLITICAL AND SOCIOLOGICAL

MAGAZINE WRITERS CANDIDLY DISCUSS SUZUKI CABINET

Tokyo JIYU in Japanese Sep 80 pp 162-178

[MASS-COMMUNICATIONS 'SECRET' INFORMATION; Series 9 anonymous magazine writers' discussion meeting]

[Excerpt] Difference Between Prime Minister Predicted by Mass Communications and Realpolitik--LDP Wins and Mass Media Lose

"K": Emergence of a Zenko Suzuki cabinet differed from the expectations of mass communications. On this occasion, I feel that there is a need to reflect anew upon past mass media information. First of all, I think that today's mass media personnel are conceited. As far as the recent event is concerned, it seems that the mass communications people had from the beginning the conjectured image of a prime minister. It appeared as though the news reporters' attitude toward news gathering was based on this conjecture. Generally speaking, today is said to be the age of the news scoop, and there is a tendency to try to gather information before others without confirming it. More often than not, it seems to me that reporters are trying to build their own cases.

"N": Before the name of Zenko Suzuki was mentioned, the commonsense viewpoint was to regard Toshio Komoto as the favorite. The mass communications stuck to their choice of Yasuhiro Nakasone, and all the newspapers played him up. Komoto had stronger monetary and personnel support and the backing of the financial circles. Komoto had more going for him to become the premier. However, there were circumstances that might enable the perennially disappointed Nakasone to pull off a last minute upset. The various newspapers and magazines wrote about his connection with Mejiro [reference to former Prime Minister Tanaka who resides there] and a number of other factors. In this controversial situation, news that a compromise was possible came from one source. That was when the name of Zenko Suzuki came up, but even if a compromise candidate were to emerge, his name appeared so soon that reporters were surprised and believed that it must be a mistake. They believed someone quite different would emerge, even if there were to be a compromise candidate. That was our outlook, to say the least.

"K": When Zenko Suzuki was mentioned, the reporters realized that he was not among those whom they were building up or anticipating. Therefore, in news gathering, the reporters probably took the attitude of negating Suzuki. I say that because on Saturday night, I spoke to a staff employee of the Liberal Democratic Party [LDP] and he said that the selection of Zenko Suzuki as party president was generally decided. Furthermore, the present LDP found the following as most desirable for the three leading party positions: Noboru Takeshita as secretary general, Kiichi Miyazawa as chairman of the Policy Affairs Research Council and Shintaro Abe as chairman of the Executive Council. However, Yoshio Sakurauchi was a creditable achiever in the elections and depending on his appointment, there might be personnel shifts so the three party positions are not yet definite. Sakurauchi might become the LDP vice president. That was the account I heard. On Monday, when the editor of our weekly magazine telephoned me, I reported the above to him. At the time, we could have made the publication deadline of the week's issue, but when I gave him the above news, he questioned me twice as to its veracity. I said I cannot give a 100 percent guarantee but I believed the account to be 90 percent accurate. Therefore, I suggested that [with mention of Suzuki] the three party nominees be presented as the most acceptable slate of the LDP core, but the week's issue of the magazine again selected Nakasone as the likely candidate. Ironically, Suzuki was chosen on the day the magazine hit the stands.

"Y": That is true, although we were aware of the elimination process. Frankly, upon reflecting, during the period immediately after the elections and before Suzuki was selected, Nakasone suddenly emerged simply because O.K. was given by Mejiro [former Prime Minister Tanaka], and this became a sort of credit to him. With Komoto, too, the only inkling we had was that the financial circle was in full support of him. Attention was focused on these two persons because information on them greatly increased and was plentiful.

If we had been coolly thinking about the developments, we would've realized, for example, that Nakasone switched to the LDP mainstream during the recent Diet non-confidence vote, but several months prior to that, he held a leading position in the anti-mainstream group. Therefore. he had a decisive weakness and although he switched his stand, credit could not accrue to him so simply. Even with Komoto. who created a sudden boom, with many Diet members supporting him because of his financial backing and disbursement of considerable election funds within the party, he also had a decisive weakness because he was a member of the Miki faction. If you reason in this manner, by process of elimination, the name of Suzuki should have emerged, but there was already available much stronger supporting information.

This is an afterthought, but when Ohira died, in the muddled situation, the prediction that the next party president would unmistakably come from the mainstream, which succeeded Ohira's faction, was not credible without considerable backup evidence. Unfortunately, I feel that we were swayed by the general trends of the times.

"K": I think that in gathering information materials, for example on political party trends, whether it be the LDP, Japan Socialist Party [JSP] or Democratic Socialist Party [DSP], information on the most important personnel or events cannot be obtained unless you can penetrate the minds of the top leaders, but on related items, old-timers in the secretariat possess considerable information. These persons do not have the power to influence political trends or affect personnel movements, but they are more accurate and faster than Diet members in assessing the party trends. With regard to the development under consideration, members of LDP election office were surprisingly knowledgeable. In the future, I think that it is important to accurately cover these information sources. It is fine to operate on one's own theories but if you keep doing that, you might wind up as an ex-reporter someday. On this occasion, I think that we should take the attitude of retracing our steps and reconsidering our efforts to obtain accurate information.

"O": I think that the candidate widely considered acceptable was Kiichi Miyazawa. The Americans had hopes in him. The assumption of the mass communications that the probable successor would be one of the three, factional leader Nakasone, Komoto or Miyazawa, was the greatest error. (Barewald) of the University of California who recently visited Japan--a person held in high esteem by Ohira--is reported to have said that he did not think, from the beginning, that Miyazawa would be able to succeed as leader of Kochi-kai. Historically, he was not on good terms with Ohira and was closer to Maeo. When he switched from the House of Councillors to the House of Representatives, i.e. before he became a representative, he was pushed for a ministerial position. However, there were doubts within the party as to whether a person such as Miyazawa should be recommended for minister. Within the party, Miyazawa's reputation is not as good as the public thinks. In other words, the successor to Ohira was not Miyazawa. He said that if factional movements had been watched objectively, the name of Zenko Suzuki should have appeared earlier. The contest was not among Nakasone, Komoto and Miyazawa, but from the start, it involved Nakasone, Komoto and Suzuki. Mass communications misinterpreted the situation because they were influenced by the desire to see Miyazawa selected.

There was another error. Cornell Curtis of the United States was visiting Japan to survey the political situation after the elections. Because many of the scholars visiting Japan cannot speak Japanese, they call on Diet members who can speak English. Miyazawa is a steady reader of TIME and NEWSWEEK and is facile enough to constantly read English newspapers and periodicals. American visitors flock to Miyazawa's place. Therefore, he is well-versed in the international situation and he was the mass communications' "close-up" choice as the next LDP presidential candidate. There is a tacit, basic principle in the LDP that only the mainstream can hold political authority. Since this fact was known from the beginning, minus points should have been given to Komoto of the anti-mainstream and Nakasone of the non-mainstream. Since there was no appropriate candidate in the Tanaka faction, the successor in the Ohira faction should have been presumed to take over the government. If such were the case, cool-headed consideration should have been given as to who would be the successor to Ohira. In spite of that, because of his international awareness and indescribable attraction, Miyazawa became the focus of attention and as a result, the slate of three candidates was formed. We made an error, from the beginning, on that point. We can only say that including ourselves, those who study politics were terribly amiss when Zenko Suzuki's name did not emerge at that stage. Now, everyone thinks that the person to take over the Ohira faction was not Miyazawa but Zenko Suzuki, but at the time, everyone was talking on the assumption that Miyazawa was going to be the successor. However, the first person to disappear from the scene was Miyazawa and later, as the discussions centered on Komoto and Nakasone, Zenko Suzuki suddenly surfaced. When Miyazawa disappeared, we should have analyzed more carefully as to who would be the successor of the Kochi-kai or Ohira faction and we would not have been surprised even if Zenko Suzuki's name suddenly appeared.

When Suzuki's and Mejiro's relations are considered, it seems logical since the former was one of the latter's closest associates. However, an objective appraisal of the situation reveals that Nakasone had Secretary General Sakurauchi and upon switching to the mainstream, Ohira suddenly passed away. Not only as a factional leader but in actual accomplishments, Nakasone far surpassed Komoto. In view of these developments, talk of a Prime Minister Nakasone began to be heard. It also appears that Curtis of America discounted Suzuki, from the outset, saying the latter could not possibly lead the politics of Japan. Therefore, expectations placed on Miyazawa were all the more great.

"N": I am considering the recent event from a somewhat different aspect. There were sufficient indications that Zenko Suzuki might take over the Kochi-kai.

However, information was also plentiful that Suzuki could not be the successor of the Ohira faction. First, the financial source of the Ohira faction is the bureaucratic pipeline and since he was not a bureaucrat, it would be extremely difficult for him to represent the Kochi-kai. Secondly, Suzuki himself wanted to support Miyazawa, who was his distant relative, as the Kochi-kai successor, and make him the prime minister in the future. However, since Miyazawa had not done enough for the faction and might be accepted by the intelligentsia but not the LDP, Suzuki wanted to minimize this minus aspect by grooming him for a while. During that period, Suzuki was willing, as a temporary measure, to hand over the political reins to someone else. Thirdly, there was an anti-Suzuki force within the Ohira faction. Ohira did not completely trust Suzuki, and people like Masayoshi Ito and Kunikichi Saito are in the anti-Suzuki group. As for Rokusuke Tanaka, he had conducted himself up to the last moment as an anti-Suzuki member and in fact, had been for Shintaro Abe. The moment the tide turned in Suzuki's favor, he started to support Zenko. If there is anyone who claims that we should've predicted the choice of Zenko Suzuki as a cinch, inthe light of this situation, I think that, to the contrary, that person's logic is unsound.

"K": Does logic hold water in the world of politics?

"N": That may be true, but this selection was totally illogical. So I think that there are two sides to this issue. On the one hand, there is the backstage formation of a political regime, a ritualistic transfer of political power in the LDP tradition, and on the other, a theoretical approach that the prime minister should be a person of this high character, though this is wishful thinking. Zenko Suzuki was a person who did not fit into either category and it would be odd, I think, to call such a person an absolute choice since there are no odds as in horse race betting.

"Y": Wasn't there a conjectured image of a prime minister? However, it cannot be said that the successive post-war prime ministers were all fit for the position. Were the successive prime ministers, since the Meiji era, all persons of a certain high caliber? I think there are many who can be questioned as to why they occupied the premiership at a particular time in history. If that is the case, it is not necessary that the prime minister meet certain qualifications. Rather, it would be more sensible to recommend one because he has served 10 terms as Executive Council chairman. People seem to agree with the choice, once the prime minister is selected.

"K": The 1980s are referred to as a muddled period. It appears that, amidst this situation, the prime minister of a country emerged in some opaque form with the assistance of many.

"N": Therefore, I think that all of the assessments with regard to Zenko Suzuki are retrospective. He became a prime minister without spending money. In the confused period of the 1980s, a person who can function as an arranger to settle matters should become the prime minister. This is undoubtedly a retrospective argument. I would've dared anyone to say that a week ago. (Laughter).

"Y": The worst ones are the business and labor circles. They all claim they are for the Zenko-type and speak as though that was the most appropriate choice for the 1980s. They have the nerve to say that. (Laughter).

"N": In that case, we'd feel better if we admitted that we missed completely and take our hats off. (Laughter).

"O": From our standpoint as mass media, I believe that the biggest reason why people said that Zenko had no chance of becoming the prime minister or LDP president was his connection with Mejiro [former Prime Minister Tanaka]. We razzed him as being "under the thumb" of Kakuei Tanaka. Although he was in the Ohira faction, his relations with Kakuei were so close that it was said his official affiliation was with the Tanaka faction. During Ohira's time, his cabinet was called "Kakuei's shadow cabinet," and it so happens that the succeeding cabinet is one "under Kakuei's thumb"...It was felt that Tanaka would not take such a drastic action, i.e., there was a sort of expectant mood that he would not openly install such a person. After the big LDP victory, Tanaka's faction increased, too. Since the LDP majority was no longer an extremely slim one as before, it was believed that, in a sense, party unity would be strengthened and there would be a cabinet unanimously supported by the government party. Tanaka did not have to come out and say, put in my "puppet government," because even if Nakasone or Komoto or Miyazawa were installed, he could later manipulate anyone with his majority faction. It was thought that there was no need for him to forcefully put in his own regime. There was no question that Suzuki would be publicly criticized if he were selected as prime minister. There was no need for him to stubbornly push a person who would receive public criticisms. Undoubtedly, there was a feeling that nothing of the wort would happen.

"N": I think that that is the most important point we should consider in retrospect. Mass communications have suffered a continuous string of defeats. Since the 40-day struggles [1979], there has been one defeat after another. I believe that the cause is, as with the thinking of the [Yomiuri] Giants team, we have begun to play sandlot baseball as semi-professionals. By that I mean that without the skills, we are looking for signs and trying to react to the signs. If you were to ask who is giving out the signs, I'd say that it is the person in Mejiro. The greatest cause of our misinterpreting trends is the fact that we belive politics is all decided by the signs from Mejiro. I believe that like Nagashima's Giants team, we have to do some reflecting. (Laughter).

"O": Ten days before the final selection of Suzuki, a member of the Nakasone faction telephoned about 1000 hours, Saturday morning, and said that Nakasone was out. Rokusuke Tanaka and Kunikichi Saito did the running around, Nobusuke Kishi and Kakuei Tanaka then joined hands and Secretary General Abe took the final action, and the outcome was the decision to select Zenko Suzuki for this round. Nakasone could do nothing about this. If he were to start a fight, he would only split the party and he could not do that now. He had no choice but to cooperate. Having come this far, it is very regrettable. That was the phone call I received. Well, I thought it made sense. Then the newspapers began to write that the only way out was to pick Zenko.

Putting aside the fact that such information was available, it is still true that the prime minister was selected through the alliance of the political world's behind-the-scene operator Tanaka and the old master Kishi. Kishi wants to make Shintaro Abe the next prime minister. To do that, he wanted Abe to become the LDP secretary general and if that condition were acceptable, the Fukuda faction would cooperate. Rokusuke Tanaka and Kunikichi Saito acted as runners among the concerned parties. In this manner, Nakasone was eliminated. The mainstream believed that even if eliminated, Nakasone would not desert the party or take counteraction.

In this light, the explanation becomes very clear, leaving aside the question as to whether the power of Mejiro is strong or weak.

The Reputation of the New Cabinet and the Aim of Prime Minister Suzuki--Nakasone and the Bureaucratic Group in a Dilemma

"K": The Suzuki cabinet has been formed and isn't the reputation of cabinet members good as compared with previous cabinets?

"N": I think that that is because the cabinet is not selected through the elimination process. In other words, there are no really unqualified persons in it. There are some questionable choices but the number is relatively few.

"O": I think that this cabinet has a good reputation because the Tanaka faction was not given preference. The key positions of foreign minister and health and welfare minister are held by his own faction, and Tanaka faction members, such as Takeshita and Kanemaru, who were expected to be appointed, were omitted. Another reason is the appointment of Nakasone and Komoto to the insignificant posts of Administrative Management Agency director general and Economic Planning Agency director general, and Nakagawa to another easy position of Science and Technology Agency director general. People are saying that Suzuki's skill in personnel selection stems from his many years of service as Executive Council chairman. I also think that because of that experience, not too many demands were made on being included in his cabinet.

Let us examine the situation carefully. Masayoshi Ito was brought in as the foreign minister, but everyone thought that a qualified well-known figure would be appointed and not even Suzuki would utilize the position as a slot for factional members. If Ito were appointed foreign minister simply to continue Ohira diplomacy, and Suzuki had pushed extra hard for his selection, then Suzuki must be called a terribly shrewd scoundrel. To try to bulldoze through international relations, which are expected to become even more difficult, with Ito as the foreign minister, is a political choice which, I think, belittles the people.

Also, the appointment of Michio Watanabe as the finance minister raises a big question. Suzuki is credited with having brought in an unusual person, and his skill in selecting personnel is being highly evaluated, but I believe that when things start moving, something terrible is going to happen. Mass communications people must carefully watch the developments.

"N": From the foregoing, it appears that Suzuki's choices were not intended to benefit the people but to satisfy factional needs, especially those of the Ohira faction. For one thing, Masayoshi Ito and Kunikichi Saito were appointed to rather important posts. In other words, selection of anti-Suzuki persons to important posts would consolidate factional unity.

As the health and welfare minister, the ability of Saito will be tested in the ministry's health insurance administration, policies toward the medical association, etc. especially at this time, since President Takemi of the Japan Medical Association is reportedly in ill health. To be more explicit, he will become the minister to draw up the blueprint for the post-Takemi period. This is an important post that drew the attention of everyone. Kunikichi Saito appeared on the scene. To be frank, however, his administrative ability is unknown. Suzuki "bottled up" such a person in a very difficult post, one that is said to have the most potentials for graft.

With regard to Ito, Suzuki "contained" him by saying that "since you became well known during the summit conference, I want you to carry on Ohira's policy as the foreign minister."

The selection of Kiichi Miyazawa as cabinet secretary is the most noteworthy point about this cabinet. If you consider that Miyazawa's reputation was not good until now, you would realize why in the position of cabinet secretary, he needs to be exposed fully to the public and to show his true merits. In other words, a person must develop an all-around winning personality and must be able to put on an act. In that sense, this is the most important position. He will receive his baptism in a new field and undergo training. The cabinet secretary is the linchpin in government administration as well as party affairs. He will have the job of looking after both factional and governmental matters. Suzuki placed Miyazawa there so he can receive the training he needs in order to develop.

It seems that these three appointments were Suzuki's key selection and the rest was a matter of deciding who goes where. In other words, one can say that the appointments were made out of consideration for the Ohira faction. Nakagawa, Nakasone and Komoto were picked for the reasons stated previously. With respect to the selection of Michio Watanabe, the point in consideration was how to distribute the honors, and no one is counting on his economic ability. From that standpoint, it can be said that the person easiest to replace was put in as finance minister.

"Y": I do not think that Zenko Suzuki decided alone on the cabinet selections. Unless you search for his real intentions, the true nature of Suzuki's cabinet cannot be determined. There was sufficient time on this occasion to form the cabinet, although he seems to have implied that if he didn't have the time, he could have gotten away with spot decisions. Where is the nucleus of Suzuki's cabinet--is it in the Ohira faction or in Mejiro? Since there are very knowledgeable persons in the cabinet, a careful analysis must be made.

"N": Although this contradicts the previous statement that we are swayed too much by the Mejiro signs, we still have to think about Mejiro. When this cabinet was formed, there was considerable talk that Takeshita would remain. However, he did not enter the cabinet. At a glance, it appeared that Kanemaru contributed to the making of Zenko Suzuki, but he was not given any favors. On the other hand, Nikaido was given an important position. Although it remains to be seen yet what party position would go to Ganri Yamashita, as far as Mejiro is concerned, he is thinking of his immediate disciples, Susumu Nikaido or Ganri Yamashita, as his successor. It has been said from before that he thinks of Takeshita and Kanemaru as belonging to a branch stream of his faction. If you view the situation in this light, Suzuki's cabinet is made up of persons liked by Kakuei Tanaka. Cabinet selections seem to show openly the influence of Mejiro.

"K": I think that it is a fact that the appointments favored the Ohira faction. However, even if only outwardly, the selections can be justified. To explain further, Ito did serve as the temporary premier. This "big-shot politician" is made the successor of Ohira diplomacy. Foreign relations are conducted, however, mainly by the bureaucrats, and the remaining tasks can be carried out, to a certain extent, by one's reputation. Even with Kunikichi Saito, he has served twice as minister of health and welfare. It is important that a person who has served twice previously should serve again, and it can be said that the choice was appropriate. The most questionable selection is Finance Minister Watanabe. At this time, when the financial situation is in such a critical stage, a person whose capability is totally unknown was appointed. As far as finances are concerned, even the prime minister is not knowledgeable.

"N": If the selection has to be justified, it would probably be said that rejuvenation was sought and a younger person was asked to take the important post. Furthermore, it can also be said that a non-factional member was brought to the finance minister's position.

"K": It is a position confronted with the task of solving many problems, including the "3K" issue, tax system, etc. A superficial-minded person will never do. Considering various angles, Watanabe was probably selected for his political acumen. His choice also made it easier to win over Komoto on the pretense that he would be overseeing the Japanese economy.

"N": Suzuki probably told Komoto that he was the "deputy prime minister."

"K": Komoto was probably told too that he would have total responsibility for the economy. With respect to Kiichi Miyazawa, as a person who knows his personality, I find his selection as the cabinet secretary a refreshing one. He is of a somewhat different type from the traditional cabinet secretary. If anyone in the past resembles him, it would be Toshio Kimura. When I consider that Miyazawa cannot become obsequious [when politically necessary]. I get confused as to whether he is the right choice or he is the cabinet secretary of a new age.

"N": He reminds you of Yasumi Kurokane.

"K": Kurokane is somewhat gloomy. A while ago, I was talking to an LDP Diet member who said that, although Kiichi Miyazawa and Toshio Kimura are claimed to be the same type of cabinet secretary, I found that Kimura has a warm personality whereas Miyazawa is cold. Both read Western books, but Miyazawa shows it openly while Kimura seems to be doing to reading privately somewhere.

"N": The following is an episode about Miyazawa. A famous commentator, "K," is a strong supporter of Miyazawa. At a certain lecture meeting, both were present. During his talk, "K" stumbled over a proper noun. Miyazawa, who was seated besides him, promptly pointed out the correct word. "K" turned red in the face and shouted that "because you do such things, you cannot become the prime minister." Miyazawa has that trait.

"K": Joji Omura of the Tanaka faction was appointed as Defense Agency director general, but he has not been too well known till now. What type of person is he?

"N": His capability as Defense Agency director general is unknown. To be frank, I have hardly heard of him.

"Y": I have the impression that Omura is a prudent person. I can speak from my own experiences. He is the exact opposite of a person who came up from the ranks. When he was a rank and file politician, I wondered whether he would be a good sport and relate inside stories of the political world if I interviewed him. He readily admitted that he was only a minor figure in the political circle. He knew how to be sportive and gave me the impression a number of years ago that he cannot be disregarded. Now that he has become the Defense Agency director general, he would probably show up appearing sharp as though he would look good in uniform. In other words, since he is the bureaucratic type and a sportive, prudent person, I think that he can be regarded as the type of politician who will not make fatal errors. However, at the present stage, when defense is being watched as a big problem which can affect the country's security, his capability is unknown as to whether he can handle the duties of a Defense Agency director general.

"O": As justice minister, Seisuke Okuno of the pro-Tanaka faction was chosen. If the present cabinet is carefully scrutinized, person by person, there are many new faces of unknown caliber, and the cabinet seems refreshing. Overall, it appears that appointments were made to reward the anti-mainstream members. As finance minister, Michio Watanabe, who left the Nakasone faction, was selected. I think that this is a challenge to Nakasone, who was aiming for the finance minister's position. Within his faction, there was an overwhelming opinion that he should not enter the cabinet unless he was appointed finance minister. If Nakasone had put up an opposition at this point, there is no telling what might've happened. If the ex-Nakasone faction loner Watanabe, whom Nakasone hated most, should form his own faction, a number of Nakasone faction members might have joined him. Watanabe was chosen as the finance minister and on the same level with Komoto, Nakasone was given the position of Administrative Management Agency director general. The manner of persuasion was shrewd. Since Komoto would be on an equal level as Economic Planning Agency director general, Nakasone was asked to head the Administrative Management Agency, and he could not refuse. At the time of the no-confidence vote on Ohira's cabinet, Komoto was in the anti-mainstream, and it was Nakasone who cooperated. Nakasone's feelings can well be imagined. Nakasone faction members were chagrined and challenged his placement on an equal level with Komoto. When the no-confidence vote was taken, Komoto was absent, while the Nakasone faction cooperated. Why should Nakasone be appointed to such an insignificant post? He should resign. Nakasone was being pressured by his faction members. However, he could not rebel. This incident revealed to all party members that at the last moment he falters. I feel that from now, many problems will arise in the Nakasone faction. Zenko Suzuki was able to act so brazenly because Mejiro was behind him.

Kanemaru had schemed to boost Takeshita as prime minister and to take over the deputy premiership himself, but neither was selected for the cabinet. No one anticipated this omission. Probably, Tanaka was pulling the strings from backstage and serving a sort of warning that this is what would happen to those who opposed him and that our domination would continue for a while since it was too early for transfer to the next generation.

Another warning was included, and that was to show anti-mainstream members what would happen if they opposed the mainstream. It is being said within the Nakasone faction that if the present situation continues, the younger members cannot hope to become cabinet ministers unless, eventually, they join the mainstream. In other words, the Nakasone faction is not anti-mainstream but non-mainstream. There is great commotion within the faction about the fact that with the LDP, only the mainstream rules constantly. How he is going to quiet down his faction is the problem facing Nakasone.

"K": While cooperating, Nakasone is always pushed away from the position of political rule. In the past, Ichiro Kono constantly challenged but never succeeded in winning the political reins. Although in a different sense, there is a possibility that Nakasone might suffer the same fate of a tragic politician.

"Y": Nakasone holds an incongruous ministerial position and the most difficult. Unless he conducts administrative reforms, he will not become popular with the people, but if he does, he will be criticized for meddling and he boycotted by the entire bureaucracy.

"N": Nakasone was put on the spot when at the first cabinet meeting, Suzuki spoke as though administrative reform was the most important governmental task.

"Y": What about this viewpoint regarding recent developments? It is said that the cabinet formation was successful, but if you examine the cabinet closely, there are many members who were formerly Ministry of Interior bureaucrats. This is related to the previous account but in the Kochi-kai, there are ex-bureaucrats and among them, there are persons of different color. The former Interior Ministry bureaucrats believed that if they supported a party liner such as Zenko Suzuki, things would proceed smoothly, and so they boosted Zenko. At the time of cabinet formation, they succeeded in placing former Interior Ministry officials in key posotions. They are fully aware that unless you belong to the mainstream, you cannot get political authority. As to what constitutes the mainstream, the bureaucratic mechanism has to be analyzed in order to understand the Japanese political setup. The former Interior Ministry Bureaucrats are good at this.

"K": In the present political arena, politicians who were formerly bureaucrats are far more effective than the other politicians. With the administrative organization so well developed as at present, a considerable amount of knowledge is needed to handle a single Diet bill. Probably, among the present Diet members, there are few who can understand a budget report. That is, aside from the ex-bureaucrats. Even Masatsugu Ishibashi, who is considered to be one of the elite and an intellectual in the JSP, began to study economics after he became a Diet member. You can imagine what the situation is for others. Among the ex-bureaucrats, those who had done a lot of studying while in the government, became Diet members. From this standpoint, one can say that a significant factor in Japanese politics today is that not only former Interior Ministry bureaucrats but ex-bureaucrats from various ministries are appearing on all political fronts. However, politicians must not only be able to understand matters but are required to have decisive power, and on this point, the old party liners do have to power of decision.

JSP, Komeito and DSP Forget "Coalition" in Wake of Election Defeat; New Coalition Started Jointly by NLC and Shaminren

"K": Is this Suzuki cabinet a long-term one or a short-term one?

"N": I am reluctant to make any more predictions. (Laughter).

"Y": There is talk that it will be short-lived since "anti" is popular today, but I venture to say that it will be a long-term one. (Laughter). Perchance, isn't Zenko Suzuki another Ieyasu Tokugawa?

"O": Koichi Hamada says it will be of long duration. (Laughter).

"K": Well, what are the opposition parties doing after the elections? Dietman Eiichi Nagasue of the DSP says that since the elections, the various parties are at a loss and that might be the situation now. Before the elections, the JSP had started an earnest re-examination of what might be called its party platform, "The Road to Socialism in Japan," and as the party promised, renewed the reappraisal after the elections, but I wonder what will be the outcome?

"N": Since they lost so decisively, I think that they can carry on a determined internal struggle. It can be said that the conditions are ripe for the JSP to conduct a thorough re-examination of the "road." No matter how much of a fight the Socialist Association and the anti-Socialist Association put up, the people are not expecting much good to come from it. It is a certainty that there won't be elections for a while and the JSP cannot be hurt any more than it is. Therefore, this is a good occasion to thoroughly cleanse the party. Such an atmosphere seems to be prevalent.

According to the schedule that I heard, former JSP Chairman Katsumata was to have presented his report to the committee in September, but the schedule has been moved up. The fact that the proposal to re-examine the "road" surfaced in July means, to me, that they plan to complete the reappraisal during this summer vacation.

Although unrelated, the labor unions are about to engage in reorganization activities. The mood has strengthened within the labor unions to actively conduct their own internal struggles. The struggle between Sohyo [General Council of Trade Unions of Japan] and private establishments is getting quite severe. What will probably become an issue is the conflict between the "Labor Union Council To Promote Its Policy" of the Churitsu Roren [Federation of Independent Unions], with Katayama as chairman, versus the "Promotional Association" led by Shioji, chairman of Jidosha Soren [General Federation of Automobile Workers' Unions]. In other words, the issue of a united front will probably become a hot one from now. As far as opposition parties and labor union activities are concerned, those are about the only issues which will provide fodder for the newspapers.

"K": Before and during the elections, the slogan of "coalition" was bantered about and a certain verdict was handed down. The mass communications generally reported that because the coalition government concept was denied by the people, the various parties stopped talking about it, but come to think of it, a debate on coalition was not even held once. Each party carried its slogan as it saw fit and no real discussion was held among the parties. The JSP has begun to re-evaluate its "road" and the traits of the party. This seems to be the opportune occasion for various parties to discuss and refine the issue of a coalition of opposition parties. After seeing the election results, a certain supporter of Komeito and DSP said this was the end of the two parties, but I do not think so. I think that both Komeito and DSP will make efforts to strengthen their political bases, each in its own way, but while doing so they will reconsider coalition.

Because they were defeated before they were ready, they should immediately conduct coalition talks in earnest and consider more seriously the matter of a united front with labor. Unless they prepare their political front before the general elections expected in 1983-1984, I think the opposition parties will lose again. I would like to see the various parties immediately begin discussions instead of remaining at a loss.

"Y": I talked today with the mid-level leaders of Sohyo and heard that, even more than the people think, the political party members are crushed with a feeling of defeat. (Laughter). The people seem to be concerned only to the extent that perhaps they made a little error by permitting the LDP to win too big a victory, and they are sympathetic with the opposition parties. However, the opposition party authorities are really crushed over the defeat, and it might take a considerable time for their recovery. To start an internal struggle is useless. These persons were making drastic remarks such as shock the leaders by removing JSP Chairman Asukada; otherwise, the leaders who were stretched out in the ring were so completely out that recovery was impossible.

"K": The JSP is a strange party and when things look hopeless, a "divine wind" blows. In the recent elections, if Chairman Asukada had lost, then both chairman and secretary general would have lost, and the question of leadership responsibility would have arisen. Then, since Komeito had also decreased, the responsibility issue would have been raised as a chain reaction. The responsibility of the DSP and the Japan Communist Party [JCP] leaders cannot be overlooked. Thus, the responsibility question would have risen in all of the opposition parties and led to interesting developments which would please the mass media, but unfortunately (laughter), Asukada did get elected. The present number of 107 Dietmen was maintained. That was that. Since the opposition parties all lost, each party has its own problems but they are not considered too serious. Rather, they are at a loss just because of the election defeat. This is true especially of the JSP.

How about the New Liberal Club [NLC] which rose rapidly?

"O": I heard this from one of the NLC leaders, but there is talk of getting together with Shaminren [JSP-DSP Coalition] on the House of Representatives level. At a certain meeting, agreement was reached between Den and Kono. The biggest reason was the election of Naoto Suga. He ran as a Shaminren candidate but he was also supported by the NLC. According to the NLC, he is the type of person that the NLC would endorse, and if such members can increase, there is no need for separate organizations such as the NLC or the Shaminren. At any rate, Shaminren has only three Dietmen while the NLC has 12. Instead of going separately, why not get together? The only remaining problem is the name of the new party. One source says that the name of Shiminto [People's Party] has been proposed but the Shaminren is asking that the word "shakai" [socialist] be included in the party name. Whether the merger would take place is not yet certain, but the negotiations are in the final stages. The situation is this. The Shaminren stands to the right of the JSP and the NLC to the left of the LDP. Between them are the Komeito and the DSP. If the rightist and leftist elements can merge, there is a possibility that the Komeito and the DSP can be absorbed. No matter what has been said about them, in the past, such as the differences between the DSP and the JSP or what the Komeito stands for, it is a fact that the two small parties, caught in a squeeze, have been pushed around. However, if the aforementioned merger takes place, there is a possibility that the Komeito can easily fit in.

In the recent cabinet formation, a big scar has been left in the LDP because of the extremely cool treatment given the Nakasone faction. At a certain meeting a while ago, a Nakasone faction Dietman, Yohei Kono, and Shaminren Chairman Den got together. Takeiri was not present at the time. It was decided that a meeting of Takeiri, Den and Yohei Kono should be held. The DSP was to be left out because their thinking was different from that of DSP's Sasaki. At present, Yohei Kono is close enough to Takeiri to have their relations termed as "monolithic" but he is on extremely bad terms with Yano. First, the three persons would hold a meeting and then, the Komeito, NLC and Shaminren would form an organization and establish the nucleus for a coalition. Another factor to consider is the small earthquake occurring in the LDP. The earthquake has the potential of becoming a big earthquake. If Nakasone decides that he can never take over the political reins under present circumstances, he might take with him a number of persons and join the forces of Kono, Shaminren and Komeito. In the immediate future, Nakasone and Takeiri will hold a meeting. Where the meeting will be held is unknown. Nakasone is said to have revealed to a certain person that he had made up his mind. He will get nowhere as it is. If he cannot take over the government 2 years hence, the only thing he can do is to start the ball rolling. If he gets going, Komoto might not follow him, but a number of former Miki faction members might join him. Takeiri and Nakasone would join hands and Kono and Den would align with them. Whether the rightist elements of the DSP or the JSP would join is debatable, but they will be invited. In the general elections expected 3 years from now, they will have organized close to 100 candidates, at the least. It is possible they can become a force surpassing the LDP. This is said to be the only way the Nakasone can have his political regime. Because of the cool treatment given Nakasone in the recent cabinet formation, small fissures are beginning to appear in the LDP, and stories, such as the foregoing, are beginning to be heard.

In other words, Japan is a tripolar structure. There are the LDP, the anti-mainstream LDP and middle-of-the-roaders, and left-wing forces consisting of the JCP and leftist elements of the LSP. This tripolar setup is inevitable. For Den as well as Yohei Kono, the opportunity is presenting itself for them to get together to consolidate their forces within the next 3 years.

This movement has considerable potentials. The last election showed that the Japanese have conservative trends. They are not for the JSP or JCP, neither for Komeito nor the DSP. They are a little further to the right. Since they had no other choice, they cast their ballots for the NLC and the LDP, which won 287 Diet seats. According to public opinion polls taken by the newspapers after the elections, 30 percent of those polled said that if they had known the LDP will take that many seats, they would not have voted for the LDP. They regret having given their votes to the LDP but actually, they have no other political party to choose. They can refrain from voting but that does not seem to be the alternative they want. There is a need to form a political party of their choice. That is the new coalition or a new middle-of-the-road coalition that Yohei Kono and Takeiri are considering. Until now, they had boycotted the LDP, but it is possible at this time that Nakasone might join them. Although slight, there is a possibility that the rightist faction of the JSP might also join. This coalition might become the bud of future movements. Will the bud grow or will the talks fail and the elections, 3 years hence, see the same pattern as today? Whichever it is, I think that the possibility is greater today than ever before.

Komeito's Anguish--The Struggle Between Takeiri and Yano

"K": I've heard the rumor from before that Takeiri is close to Tanaka, but is it true that Sasaki is close to Tanaka?

"O": At present, Kasuga is close to Fukuda and not on good terms with Tanaka. Even the DSP must have a pipeline to Mejiro, and it is said that Sasaki has begun to get quite close.

Within the four middle-of-the-road parties, Sasaki is the only outcast and this is because he is not on good terms with Takeiri. The latter is a very shrewd person and is utilizing the scandals about Daisaku Ikeda of Soka Gakkai [Value Creation Society] which came up during the elections to try to evade leadership responsibilities for the election defeat and place the blame on Daisaku Ikeda's scandals. He is fully aware, too, that if he quits now there is no successor. Takeiri still has a lot of power.

"K": What about the relations between Takeiri and Yano?

"O": They are on extremely bad terms. Both Kono and Den are saying this, but the one you can trust is Takeiri. Yesterday, I met with a reporter of AKAHATA [JCP organ RED FLAG]. An investigation by AKAHATA revealed that it was "Y" who spilled information on the series of Ikeda scandals to Kunio Naito. It is reported, though reliability is unknown, that the same thing is being said among Komeito leaders. It is also said that relationships between Ikeda and Yano are not good. Ikeda and Takeiri are on quite good terms.

"Y": What do the leaders of the middle-of-the-road opposition parties think about the scandalous traits of Nakasone as a person, leaving aside the issue of his status within the LDP? There are a number of "black rumors" about him, for example, it is said that he was associated in the past with Kodama, he was involved in the Shokusan incident, he put money amounting to hundreds of millions, intended for Tanaka faction, into his own coffer, etc. Won't Nakasone's personal characteristics become an issue?

"O": As far as I know, such matters are hardly mentioned. It is possible that should Nakasone, Takeiri, Den and Kono take to their respective parties items [relative to Nakasone's scandals] that they mutually agreed upon and ask for consent of party members to do as the leaders please, they could split their parties apart. But the party leaders are not talking about an individual's scandals. Rather, they are talking like politicians that if Nakasone is willing to participate in developing this new possibility, let us pull him in. Takeiri is taking the initiative in this action. If the coalition is to be formed, the scandals of an individual are not regarded as a problem at the level of party leaders. However, I think that an individual's scandals would pose a problem if they are brought before the party members. As in the case of Shakomin [JSP, Lomeito, DSP], the great cause will be put in the forefront, and if an election is to be held, it is possible that the coalition concept would immediately materialize.

"K": Whether in the Shakomin or the present coalition, Lomeito is always the center and pulled from both sides. Except for Jishakyo [LDP, JSP, JCP], Komeito is best qualified as a national political party in organization as well as publicity.

For those reasons, Komeito is always the target but behind the Komeito is Soka Gakkai, and it is a fact that hopes are placed on Soka Gakkai's power. However, at present, the relations between Komeito and Soka Gakkai are not altogether good.

"Y": Outwardly, they are bad. However, the basic problem is that the Soka Gakkai itself does not possess the power that it once had. Membership has decreased and the Ikeda scandals came out. Members want to restrict their activities to Gakkai and cannot afford to dole out money to both Gakkai and Komeito. Furthermore, they seem to be under unjustly severe public criticism. To put it sarcastically, the issue is not whether the relations are good or bad but the problem is the considerable loss of Gakkai's power as compared with before. This is a serious matter for the Komeito, too.

"N": Isn't the Komeito in favor of leaving the Soka Gakkai? However, in leaving the Gakkai, Komeito must plan concrete measures and they cannot survive without somehow getting labor union votes. That is why they have shown interest in Sohyo and Domei [Japanese Confederation of Labor]. I've heard that they also considered a coalition of Shako [JSP, Lomeito] or Komin [Komeito, DSP].

0134
CSO: 4105

MILITARY

JDA SUBMITS FY 1981 BUDGET REQUESTS

Tokyo JPE AVIATION REPORT-WEEKLY in English 10 Sep 80 pp 1-6

[Text]

The Japanese Defense Agency (JDA) will request appropriations of ¥2,446,500 million for FY 1981, up 9.7 percent over the current fiscal year. The proposed budget contains ¥2,162,721 million for the Self-Defense Forces and JDA, and ¥283,800 million for the Defense Facilities Administration Agency (DFAA).

Major military items which JDA plans to procure in FY '81 include: Six Lockheed C-130H transports, one 4,500-ton DDG, three 2,900-ton DDs, 80 Model 74 tanks, and seven 203mm new self-propelled howitzers.

For procurement of antiair missile systems, JDA will request ¥59,689 million for improved Hawks, Nike-Js (one group each), ten Tan-SAM sets and 49 Stinger portable antiair missile units for the ground and air forces.

Concerning new aircraft-related R&D items, JDA will request ¥2,398 million for basic designing of the MT-X medium trainer aircraft, ¥2,510 million for studies and fabrication of the configured control vehicle (CCV), and ¥2,550 million for fabrication of five turbofan engines for the MT-X.

The request by the Technical R&D Institute (TR&DI) will total ¥35,422 million up 23 percent over this fiscal year.

A breakdown of the FY '81 defense budget request follows:

*Comparison with previous years

- unit: ¥100 mil.	FY '79 Allocation	FY '80 Allocation	FY '81 Requests
Defense Agency allocations and requests	20,944	22,301	24,465
% up from previous year	10.2	6.5	9.7
1. JDA & SDF	18,526	19,705	21,627
% up from previous year	8.4	6.4	9.8
2. DFAA	2,417	2,596	2,838
% up from previous year	26.0	7.4	9.3

*Organization-by-organization breakdown in the expenditures account

- unit: ¥1 mil.	FY '81 Requests(A)	FY '80 Allocations(B)	Up (A)-(B)	Up (A)/(B)%
GSDF	937,195	887,275	49,920	5.6
MSDF	571,188	509,657	61,531	12.1
ASDF	584,625	514,435	70,190	13.6
sub total	2,093,008	1,911,367	181,641	9.5
Internal Bureaus	7,835	6,771	1,064	15.7
Joint Staff Council	909	843	66	7.6
Defense Staff College	691	785	-94	-11.9
Defense Academy	9,866	8,902	965	10.8
Defense Medical College	11,155	9,336	1,819	19.5
Technical R&D Institute	35,422	28,770	6,652	23.1

- unit: ¥ 1 mil.	FY '81 Requests(A)	FY '80 Allocations(B)	Up (A)-(B)	Up (A)/(B)%
Central Procurement Office	3,833	3,686	148	4.0
sub total	69,713	59,092	10,621	18.0
Total	2,162,721	1,970,459	192,262	9.8

*Class "A" army equipment

- unit: ¥1 mil.	Q'ty	FY '81 Expenditure	Follow-on Disbursement	Total Spending
New type pistols	2,200	0	196	196
Model 64 rifles	5,000	0	770	770
Model 62 machine guns	51	0	99	99
Model 74 machine guns	38	0	93	93
84mm recoilless guns	219	0	495	495
Model 79 Ju-MAT launchers	9 sets	0	559	559
Model 64 81mm mortars	44	0	121	121
Model 75 155mm self-propelled howitzers	34	0	8,938	8,938
203mm self-propelled howitzers	7	124	1,949	2,073
Model 75 130mm multiple-loaded rocket launchers	8	0	1,564	1,564
Model 74 tanks	80	0	27,396	27,396
Model 73 APCs	9	0	892	892
Model 78 tank recovery vehicles	5	0	1,160	1,160

Model 78 snow vehicles	30	0	789	789
Model 70 pontoons	3	0	452	452
Total:		124	45,472	45,596

*Aircraft

- unit: ¥1 mil.	Q'ty	FY '81 Expenditure	Follow-on Disbursement	Total Spending
GSDF				
OH-6D helicopters	8	93	1,411	1,504
HU-1H helicopters	6	225	2,853	3,078
LR-1 turboprops	2	65	905	970
sub total:	16	383	5,169	5,552
MSDF				
TC-90 trainers	4	199	1,611	1,810
KM-2 primary trainer	1	11	155	167
HSS-2B helicopters	11	646	28,048	28,694
S-61A helicopter	1	51	1,730	1,781
sub total:	17	907	31,544	32,451
ASDF				
F-1 support fighters	3	349	6,015	6,365
E-2C early warning aircraft	4	1,668	48,156	49,825
C-130H transports	6	2,508	38,874	41,382
T-2 advanced trainers	9	622	19,461	20,083
MU-2 rescue aircraft	1	41	455	496

V-107A helicopters	2	231	2,766	2,996
sub total:	25	5,419	115,727	121,146
Total:	58	6,710	152,440	159,150

*MSDF shipbuilding

- unit: ¥1 mil.	Q'ty	FY '81 Expenditure	Follow-on Disbursement	Total Spending
4,500-ton DDG	1	5,030	56,950	61,980
2,900-ton DDs	3	1,780	101,741	103,521
2,200-ton SS	1	471	29,746	30,217
440-ton MSCs	2	14	9,296	9,310
500-ton LSU	1	86	1,546	1,631
1,100-ton AGS	1	650	5,874	6,524
3,600-ton AS	1	318	30,545	30,863
sub total	10	8,348	235,697	244,045
Auxiliary ships	5	701	334	1,035
FRAM program		1,040	18,286	19,326
Total:		10,089	254,317	264,406

*Guided weapons

- unit: ¥1 mil.

Item	FY '81 Expenditure	Follow-on Disbursement	Total Spending
Nike-Js (for one group)	526	1,499	2,025
Improved Hawks (for 2nd AAA Gp)	1,927	28,629	30,557
10 Tan-SAM sets	1,288	24,465	25,753
49 Stinger sets	677	677	1,354
Total:	4,418	55,271	59,689

*Military R&D

- unit: ¥1 mil.	Number of R&D items	FY '81 Expenditure	Follow-on Disbursement
Guided weapons	8	1,550	4,461
Electronic equipment	16	2,381	5,285
Firearms and vehicles	8	1,157	892
Ships and underwater weapons	9	1,848	4,576
Aircraft	7	1,753	7,101
Total:	48	8,689	22,315

CSO: 4120

PURCHASE OF 390 AIRCRAFT PLANNED IN FY 1980-84

Tokyo JPE AVIATION REPORT-WEEKLY in English 17 Sep 80 p 6

[Text]

The latest figures in Defense Agency's draft budget for FY 1981 cover procurement of 390 aircraft during FY 1980 through 1984, two less than originally planned in July last year. The GSDF will procure 108 aircraft (against the original request for 113) and the MSDF 129 (134), while the ASDF will purchase 153, eight more than originally planned. The increase in the ASDF total is due to the additional purchase of Lockheed C-130H transports.

Breakdown of the aircraft procurement program by service follows:-

GSDF------Total 108: 55 OH-6D helicopters, 42 HU-1H helicopters, one V-107A helicopter; two CH-X large helicopters, six LR-1 liaision-reconnaissance planes, and two TL-1 trainers. (Note: The purchase of Bell AH-1S antitank helicopters is pending)

MSDF------Total 129: 37 P-3C antisubmarine patrol aircraft, 46 HSS-2B antisubmarine helicopters, two new shipborne helicopters, six new mine-sweeping helicopters, two US-1 rescue flyingboats, three training support aircraft, eight S-61A rescue helicopters, three KM-2 trainers, 16 TC-90 instrument flight trainers, and six OH-6D helicopters.

ASDF------Total 153: 77 F-15/DJ fighters, 13 F-1 support fighters, four E-2C early warning aircraft, 12 C-130H transports, 23 T-2 supersonic trainers, six T-3 basic trainers, five MU-2 search planes, six V-107 rescue helicopters, and seven new heavy-lift helicopters.

CSO: 4120

MILITARY

GSDF-ASDF SAM DEPLOYMENT PLANS

Tokyo JPE AVIATION REPORT-WEEKLY in English 17 Sep 80 pp 6-8

[Text]

As reported earlier, the Defense Agency has requested funds in the FY 1981 draft defense budget to procure 10 units of the Japanese Tan(short-range) SAM worth ¥25,753 million and 49 units of the Stinger portable antiair missile. These surface-to-air missiles are intended for service with the GSDF and the ASDF.

Deployment plans by service follow:-

GSDF------24 units of the Tan SAM will be procured during FY 1981 through 1984 for deployment with four divisions (2nd, 5th, 7th and 11th) under the Northern Command, the Ordnance School, the Antiaircraft Artillery School, and AA Instructors School. Delivery of the Tan SAM will be at a rate of six annually. The 9,000-man divisions - 2nd, 7th and 11th---will be equipped with four units each while the 7,000-man 4th Division will receive three units. The GSDF will eventually require about 60 units to equip its 13 divisions, two mixed brigades, and service schools.

One Tan SAM unit comprises two launchers, 16 missiles, and one set of the fire control system. The unit will be mounted on an armored vehicle for mobile operation. The effective range of the Japanese short-range SAM is about 7 kilometers. A crew of 30 will be required for each unit.

The Stinger will be deployed for close air defense by infantry and artillery units. The GSDF will procure 151 units during FY 1981-84. An initial order for 37 units is scheduled in FY 1981 for the 7th Division and training purposes. During FY 1982 through 1984, orders will be placed for annual delivery of 38 units. The 9,000-man divisions will receive about 40 Stingers each and the 7,000-man divisions about 30 units each. The GSDF will eventually require 550 Stingers.

ASDF------12 units of the Tan SAM will be procured during FY 1981 through 1984, 10 for five air bases and two for the 2nd ASDF Technical School. The first four units to be ordered in FY 1981 will be delivered to the 2nd Technical School and Chitose Air Base in Hokkaido. If the ASDF plans to equip all of its seven major fighter bases---Chitose, Misawa, Hyakuri, Komatsu, Tsuiki, Nyutabaru, and Naha---with two Tan SAMs each, further procurement will be made in FYs 1986 and 1987 for two units each. Naturally if the ASDF decides to deploy Tan SAMs with 16 alternate operational bases, further procurement will be required. Specialized units will be activated to operate the Tan SAM.

Procurement of the Stinger up to the FY 1984 will total 120 units for deployment at five air bases (24 units each). The first 12 units to be ordered in FY 1981 will go to Chitose. Thirty six units will be procured annually between FY 1982 and FY 1984. The ASDF will eventually require about 900 Stingers for deployment at 23 air bases and 28 radar sites. Unless the current procurement rate is increased, it will take over 20 years to complete the program. Specially trained instructors will train air base personnel to operate Stinger SAMs.

In addition to the Tan SAM and the Stinger, the ASDF plans to introduce 20mm Vulcan antiaircraft guns for defense of air bases and radar sites. About 600 units will be required for deployment of 16 units each at 23 air bases and eight units each at 28 radar sites.

For air defense of air bases, the Tan SAM will be used against targets 10 km away. The Stinger will cover targets within the 2-to-3 km range and the Vulcan will be used against those within 1 km. Conversion of the airborne Vulcan of obsolete F-104 fighters for ground use is being studied.

CSO: 4120

MILITARY

ORDER SET FOR 120MM HEAT FOR NEW TANK

Tokyo JPE AVIATION REPORT-WEEKLY in English 17 Sep 80 p 8

[Text]

The Japanese Defense Agency placed an order worth ¥123.4 million with Komatsu Seisakusho recently for development of 120mm HEAT ammunition for use with a smoothbore gun of the projected new main battle tank of the GSDF. It was the first Japanese effort to test manufacture antitank high explosive ammunition. Komatsu will deliver a sample of its HEAT ammunition by the end of March 1981.

For the new GSDF main battle tank scheduled to be adopted in 1988, a 120mm smoothbore gun and ammunition, armor, and chassis and suspension systems will be test manufactured under FY 1980 funding. Development of APDSFS type ammunition for the 120mm gun is now under way by Daikin Kogyo. The company last year worked on APDSFS ammunition for a 105mm gun.

Daikin is manufacturing Type 76 TKG explosives while Komatsu is responsible for 90mm and 105mm TKG explosives for GSDF tanks. Armor-piercing ammunition is being imported from the United Kingdom.

The 120mm HEAT ordered from Komatsu is said to be common with that used by the US Army.

CSO: 4120

ECONOMIC

JETRO'S WHITE PAPER ON JAPAN'S TRADE PROSPECTS FOR 1980'S

OW180811 Tokyo KYODO in English 0755 GMT 18 Sep 80

[Text] Tokyo Sept 18 KYODO--Japan must take multilateral approach to maintain free trade by recognizing actual industrial situations in its trading partners in 1980's, a semiofficial Japanese trade promoting agency suggested Thursday.

Assessing Japan's trade prospect in the 1980's, the Japan External Trade Organization (JETRO) made the comment in its white paper for 1980 on overseas markets, titled "Japan's Trade in Era of Interdependence," analyzing a change in world's trade structure in 1970's.

Stressing that world economy is linked in mutual dependence, the paper said that with the 1973 and 1979 oil crises, the horizontal trade, a key factor among industrialized nations, has been enlarged into wider regional bonds, resulting in deeper interdependence worldwide.

The paper, compiled on the basis of field reports from JETRO's 74 offices in 56 countries, has angles different from the Ministry of International Trade and industry's "White Paper on Trade" made up of statistics on itemwise and countrywise export and import trends.

It observed that the "north-south problem" of confrontation between the industrialized and developing nations will turn into the era of cooperation linking the economic growth of the north and development of the south.

The paper also emphasized that growing trade frictions among the industrialized nations will directly concern international responsibility of enterprises, constituting a major issue requiring adjustment in the 1980's.

Touching on exports of light industry whose production share is high in Japan's small and medium sized firms, JETRO said that Southeast Asian nations are (?becoming) highly important export markets.

It noted that Japan's light industry products turned higher again following the yen's depreciation against the U.S. dollar after 1978.

There is a consumption boom now in Southeast Asian countries backed by their increasing income, the paper said, adding that there has been structural change in international consumption with individual consumption becoming diversified in Europe and the United States.

Describing the trend as "consumption renaissance," the paper called on Japanese firms to become knowledge intensive about commodities and exert their export efforts in this direction.

CSO: 4120

JAPAN'S ECONOMIC PLANNING AGENCY REPORTS ON BUSINESS SLOWDOWN

OW160209 Tokyo KYODO in English 0102 GMT 16 Sep 80

[Text] Tokyo Sept 16 KYODO--Signs of stagnancy in the nation's business are spreading to various sectors, the Economic Planning Agency said Tuesday in its monthly report on the economy.

The report was made by Director General Toshio Komoto of EPA at a meeting of cabinet ministers concerned with economic affairs.

It said that while consumer prices were showing a trend of stabilizing at a high level, personal spendings were continuing to indicate a tendency of declining.

It also said shipments of producers were slowing down, tempo of expansion of business marking time and corporations showing increasing signs of taking a more cautious stand.

In placing emphasis on such trends, the EPA indicated that the government's basic stand in managing the economic policies had shifted from one laying top emphasis on prices to one laying stress on both prices and business.

Based on such judgment, the government decided an eight-point package on September 5.

The EPA report said:

--Exports and private plant and equipment investments were continuing to increase but the tempo of expansion of the economy was slowing down due to dulling of personal spendings and decreased demand. Production and shipments also were declining and enterprises were becoming more cautious in making judgments on their activities.

--The rise in wholesale prices has tapered off and commodities markets are being maintained virtually on a stable basis. Consumer prices also are moving in the direction of stability but the increase rate when compared with the previous year's level still is high.

--Taking into account such a situation, the Bank of Japan lowered the official discount rate 0.75 percent last month and the government decided an eight-point package aimed at stabilizing prices and maintaining business at the present level.

--As for business situation in other countries, the business recession in the U.S. has slowed down while business in West European countries generally is moving downward. Prices are remaining at a high level but the rate of increase has slowed down. Prices on international commodities markets are rising due to unfavorable weather conditions.

CSO: 4120

ECONOMIC

JAPAN TRADE DEFICIT DECLINES IN AUGUST FOR FIFTH CONSECUTIVE MONTH

OW171107 Tokyo KYODO in English 0748 GMT 17 Sep 80

[Text] Tokyo Sept 17 KYODO--Due to brisk exports and a fall in oil imports, Japan's trade deficit was reduced in August for the fifth consecutive monthly decline, the finance ministry said Wednesday.

The deficit was dollar 783.9 million on a customs clearance basis, compared with dollar 973 million in the red in July and a dollar 1,672.9 million deficit in August last year.

August exports jumped 25.0 percent over a year before to dollar 10,390.9 million, while imports rose only 11.9 percent to dollar 11,174.8 million.

This was the first time since October, 1978, that growth rate of exports exceeded that of imports.

The figures are preliminary and may be revised later.

Exports are calculated on a free on board basis and imports on a cost, insurance and freight basis.

In yen terms, exports rose 29.9 percent to yen 2,334.4 billion, while imports increased 16.4 percent to yen 2,512.6 billion, resulting [in] a yen 178.2 billion deficit against yen 361.3 billion in the red a year earlier.

Crude oil imports in August stood at 19 million kiloliters. It was the first time since June, 1979, that these imports fell below 20 million kiloliters.

Reflecting world oil glut, crude oil deliveries carried an average price of dollar 33.96 per barrel, down from dollar 34.17 in July but up over dollar 21.11 a year earlier. This was the first month-to-month decline in oil prices since December, 1978.

Growth rate of crude oil, oil products and coal imports, valued in dollar, slowed to 31.5 percent from 74.1 percent in July on a year-to-year basis.

Export of cars and other automotive vehicles remained high in August at 491,002 units. These exports hit an all-time high of 542,000 units in July.

The surplus with the United States widened to dollar 412 million from dollar 319 million a year earlier.

Japanese autos accounted for 22.4 percent of the U.S. market in August, off slightly from a record 23.7 percent in July.

Steel exports to the U.S. halved from a year earlier to 254,000 tons, worth dollar 164.5 million which represented a 28.7 percent drop. This was the first year-to-year decline since February 1979.

Suspension of trigger price system since last March has a reason for the steep fall, ministry officials said.

The trade surplus with the nine-nation European community soared to dollar 764 million from dollar 287 million.

The trade balance with Southeast Asia turned to dollar 140 million in the black from a dollar 217 million deficit.

On a seasonally adjusted basis, total exports came to dollar 10,832.8 million, while imports totaled dollar 11,028.1 million, leaving a deficit of dollar 195.2 million against dollar 1,778 million in the red the previous month.

CSO: 4120

ECONOMIC

JAPANESE INSTITUTE ISSUES MEDIUM-TERM ECONOMIC FORECAST

OW291409 Tokyo KYODO in English 1250 GMT 29 Sep 80

[Text] Tokyo Sept 29 KYODO--The Japanese economy will register a real growth of some 6 percent both in fiscal 1981 and 1982 and the inflation rate will slow down markedly while the yen will appreciate sharply against the U.S. dollar.

This rosy picture was painted by the research institute of national economy, a government-financed nonprofit research organization, in its medium-term economic forecast, covering the fiscal 1981-83 period.

The forecast was worked out on the assumption that crude oil price increases will prove moderate in the three years--about 10 percent each in fiscal 1981 and 1982 and some 20 percent in fiscal 1983. At these annual increase rates, crude oil prices will stand at $50 a barrel in fiscal 1983.

It expected Japan's gross national product (GNP) to register an annual growth of about 6 percent both in fiscal 1981 and 1982 in real terms, with brisk capital investments in the private sector and exports as the prime mover.

For the immediate future, the forecast said the Japanese economy will face no recession at all in the current fiscal year, ending next March.

The nation's real economic growth, however, will slow down to 4.5 percent in fiscal 1983, according to the forecast.

The forecast also said the annual wholesale price increase rate will decline to 2.3 percent in fiscal 1981 from the estimated 14 percent in fiscal 1980, although it may increase slightly to 2.5 percent in fiscal 1982. [figure as received]

The annual consumer price increase rate will stand at 7.9 percent in fiscal 1980, 5.5 percent in fiscal 1981 and 5.7 percent in fiscal 1982, it added.

In fiscal 1983, however, both wholesale and consumer prices will register an increase of more than 7 percent, it noted.

The forecast also said government bond issues in fiscal 1983 will decrease to about yen 9 trillion worth, reducing the budget dependence on public borrowings to about 17 percent. The budget's dependence on such borrowings hit 34.7 percent in fiscal 1979 and 33.5 percent in fiscal 1980.

Regarding the nation's balance of payments position, it said the nation's current account will register a surplus in the first half of fiscal 1982, in contrast with a chronic deficit at present.

With foreign funds expected to continue to flow into this country in large quantities, the Japanese yen is expected to appreciate to about yen 170 to the dollar in the first half of 1982, it added.

CSO: 4120

ECONOMIC

BALANCE OF PAYMENTS SURPLUS IN AUGUST POSTED

OW300415 Tokyo KYODO in English 0405 GMT 30 Sep 80

[Text] Tokyo Sep 30 KYODO--Reflecting an improved trade balance and a huge influx of oil money, Japan's overall balance of payments posted a surplus in August for the second consecutive month, according to revised government figures released Tuesday.

The overall balance of payments (the current account plus long-term and short-term capital accounts) was $879 million in surplus.

The balance showed a $322 million surplus in the previous month for the first black figure since September, 1978.

Due to continued brisk exports and a slowdown in growth rate of imports, the current account deficit narrowed to $864 million from $1,030 million in July.

August exports came to $10,133 million, up 24 percent from the year before, while imports rose only 11 percent to $9,819 million. This left a trade surplus of $314 million, against a $113 surplus the previous month.

The trade figures were calculated on the International Monetary Fund (IMF) basis with both exports and imports calculated on a free on board basis.

On the long-term capital account, inflow of foreign investment posted an all-time high of $2,131 million, bringing a $1,075 million surplus on the account. July balance was a surplus of $799 million.

The basic balance (the current account plus the long-term capital account) returned to a surplus of $211 million in August from a $231 million deficit.

The balance of payments (in millions of dollars, revised, before seasonal adjustments):

	July	August
Current Account	- 1,030	- 864
Trade	113	314
Exports	11,241	10,133
Imports	11,128	9,819
Invisible Trade	- 1,003	-1,088
Transfers	- 140	- 90
Long-Term Capital	799	1,075
(Basic Balance)	- 231	211
Short-Term Capital	324	260
Errors and Omissions	229	408
Overall Balance	322	879

CSO: 4120

ECONOMIC

RICE WAR: COUNTRY TO FACE MORE TRADE FRICTION

Tokyo KYODO in English no time given 22 Sep 80 OW

[Article by Hidesuke Nagashima]

[Text] Tokyo Sept 22 KYODO--The Japanese are generally considered food-short, importing a wide range of food such as beef, fish and fruit. But one thing they have too much of is rice.

Japan is in the process of reducing its huge, unwanted rice stock and recently has been filling increasing orders from abroad for surplus rice--especially in the wake of worldwide grain crop damage caused by the abnormal weather this past summer.

The active exports are giving rise to concern that Japan may face yet another round of trade friction for allegedly taking business away from other rice-exporting countries.

Agriculturally speaking, this summer was a disaster, with widespread droughts, floods and unseasonable cold weather working havoc on world grain production.

The upshot of all this is that amid the worsening food shortage, there is an increasing demand for food grains around the world.

Already, there are reports that the United States, Thailand, Burma and other rice-exporting nations are unhappy about Japan's growing rice exports.

Japan's rice exports on a contract basis so far in the current fiscal 1980--started last April--have totaled 443,000 tons.

That would appear to have exceeded Japan's rice export ceiling of 420,000 tons for this fiscal year set in an agreement with the U.S., though the food agency denies it.

"The apparent total includes a shipment of 88,000 tons to food-short South Korea being sent as part of special aid after consultation with the U.S.," said an official. "That is supposed to be exempt from the export control agreement."

He said Japan has had no complaints from the U.S. over the exports exceeding the annual limit.

But even excluding the special aid to South Korea, Japan's rice exports in the first half of the fiscal year have totaled 355,000 tons, 85 percent of the annual limit.

Exports throughout the fiscal year are likely to hit at least 600,000 tons, far above the 420,000-ton ceiling, in view of the worsening world food shortage.

The export-limiting agreement was hammered out in Tokyo last April in the wake of U.S. allegations that Japan's surplus rice exports affected U.S. rice exports to South Korea, Indonesia and other nations.

Under that agreement, Japan is to limit its total rice exports in fiscal 1980-83 to 1.6 million tons, including 420,000 tons in the first year.

Of the total, exports to South Korea and Indonesia--the traditional U.S. markets--were limited to 640,000 tons, including 220,000 tons in the first year.

The agreement exempts food aid to nations hit by crop damage.

The U.S., exporting 2.2 to 2.4 million tons of rice annually from California, Arkansas and other states, is the world's largest rice exporter. In comparison, Japan exported 910,000 tons of rice in the last fiscal year.

If American rice farmers are complaining about Japanese rice exports, that's nothing new.

Japan's low-cost mass exports of surplus rice have been another source of Japan-U.S. trade friction--besides cars, home electronics and other industrial products--for some time.

The U.S. in the past has accused Japan of "dumping" rice on world markets at government-subsidized prices, threatening U.S. rice export business.

The problem has occurred basically because Japan is trying to dispose of its big excess rice stock.

The rice glut in Japan is a structural problem. The government's rice price support system, established during the wartime food shortage and continuing to this day, has the effect of encouraging farmers to keep producing rice despite declining demand.

Under the national rice distribution system, the government buys rice at high prices and sells it to consumers at low prices. The deficit is covered with tax money.

It is exactly this system that has stirred "dumping" allegations abroad against Japan's rice exports.

Recent export deals were priced at yen 89,000-99,000 (dollar 430-470) per ton, about one-third the government's domestic rice purchase prices.

The government-backed rice distribution system has remained in effect all these years while demand for rice has been steadily declining amid the growing Westernization of Japanese eating habits.

People simply have been eating more bread and less rice while the nation has enjoyed one bumper rice crop after another. The result, naturally, is a growing glut of old-crop rice in government warehouses.

To curtail the unwanted stock, the government has been promoting a five-year project since last fiscal year to dispose of 4.8 million tons of surplus rice.

The two-pronged campaign involves efforts to sell rice overseas and promote local consumption through the development of new rice-based food products.

In the last fiscal year, Japan's rice exports hit 910,000 tons, far exceeding the original target of 200,000 tons and stirring U.S. criticism, which led to the export control agreement last April.

The export contracts concluded so far this fiscal year include 158,000 tons to South Korea (including 88,000 tons in food aid that food agency officials say are exempt from the export limit) and 150,000 tons to Indonesia. Both nations suffer from serious food shortages.

Other contracts cover shipments to Bangladesh, Tanzania, Madagascar, Mozambique and Peru.

CSO: 4120

ECONOMIC

MITI REQUESTS ¥422 MILLION FOR Y-XX RESEARCH

Tokyo JPE AVIATION REPORT-WEEKLY in English 10 Sep 80 7,8

[Text]

The Ministry of International Trade and Industry (MITI) has requested ¥422 million for research into the Y-XX medium transport development project in its budget request for FY 1981 (April 1981-March 1982) announced at the end of August.

Of the amount, ¥420 million is for studies including specifications, preliminary design and evaluation tests. The remaining ¥2 million is for miscellaneous expenses.

In its industrial policies for FY 1981 submitted with the request, MITI says the government should help finance the Japan-United States-Italy Boeing 767 program and the Japan-Rolls-Royce RJ500 jet engine program as well as the Y-XX project in order to promote the nation's aircraft and engine industries. These industries are expected to play an important role as developers of advanced technology.

On the Boeing 767 program, it requested ¥2,778 million. Total expenditure by Japan in the program will amount to ¥8,325 million, half of which will be financed by the government next fiscal year. The program's financial scale comprises ¥1,782 million for design, ¥455 million for experimental development, ¥4,849 million (¥2,399 million in fiscal expenditure and ¥2,450 million in follow-on disbursement) for machine tools, ¥453 million for test fabrication, and ¥461 million for program operation.

Government financing for the RJ500 engine program is set at ¥5,157 million, consisting of ¥400 million for planning and development, ¥1,300 million for design technology, ¥700 million for research, and ¥2,800 million for fabrication. The program's total financial scale for FY 1981 is estimated at about ¥14,200 million, half of which will be put up by the Japanese side.

Budget requests involving the aircraft industry also include ¥3,300 million in loans from the Japan Development Bank or the Export-Import Bank to finance part of the costs of Japanese purchases of Boeing 767s. The financing will amount to a price corresponding to Japan's production share. Among Japanese airlines, All Nippon Airways (ANA) has decided to purchase 767s.

Other fiscal investment and loan requests for the aircraft industry are ¥500 million for promotion of the aircraft parts industry and ¥2,010 million for an aero jet engine development program.

MITI's FY 1981 policies also say research and development of the first earth resources satellite (ERS-1) for resources observation will be launched to promote Japan's resources and energy policy as well as space development technology. In the budget requests, ¥436 million is destined for the general account covering research and development of the ERS-1, ¥1,658 million to the alternative energy special account for the same purpose, and ¥2,000 million in loans from the Japan Development Bank for promotion of the space exploration equipment parts industry.

CSO: 4120

ECONOMIC

BOEING GIVES POSITIVE RESPONSE TO Y-XX PROJECT

Tokyo JPE AVIATION REPORT-WEEKLY in English 10 Sep 80 pp 7,8

[Text]

Boeing Commercial Airplane Co. has expressed positive response to Japan's Y-XX medium jetliner development project. The positive response came when representatives of Japanese aircraft manufacturers held talks with Boeing executives in Seattle recently to find out its attitude toward the Y-XX project, which has yet to take definite shape, according to Japanese industry sources.

Boeing execs told their visitors that the company is ready to discuss a specific design for the Y-XX and a development schedule on condition that the Y-XX would be developed jointly by Boeing and the Japanese aircraft industry.

The representatives, including Managing Directors I. Shibuya of FHI, K. Ikeda of MHI, and K. Uchino of CTDC visited Boeing at the request of the Policy Subcommittee, Aircraft Division, Aircraft and Machinery Industry Council, an advisory body to MITI. Shibuya and Ikeda also visited Fokker and Airbus Industrie together with Managing Director T. Yamada of KHI for the same purpose before visiting Boeing.

Regarding the Y-XX project, Fokker has proposed joint development of the F-29, and Airbus Industrie has come up with the SA plan.

The direct talks with the three foreign firms have found out their policies on new aircraft projects. However, the Japanese representatives have differences over some aspects of the partner selection. Under the circumstances, FHI Chairman Eiichi Ohara, who is also Chairman of the Society of Japanese Aerospace Companies (SJAC), will visit Chairmen Gakuji Moriya of MHI and Kiyoshi Yotsumoto of KHI soon in order to exchange views, according to aircraft industry sources.

The three industry leaders are then expected to submit their unified opinion to the advisory council on foreign partner selection.

CSO: 4120

P-3C EQUIPMENT TO BE PRODUCED HERE UNDER LICENSE

Tokyo JPE AVIATION REPORT-WEEKLY in English 17 Sep 80 3-5

[Text]

The Japanese Defense Agency (JDA) has decided to locally procure 26 items for the ten P-3C antisubmarine patrol aircraft which will be ordered this fiscal year under its second P-3C production program. A breakdown of the manufacturer-licensor listing follows:

ITEM	JAPANESE MANUFACTURER	LICENSOR
ARC-143 UHF radio	Mitsubishi Electric Corp.	RCA
ARN-83 automatic direction finders	"	Collins Radio, Rockwell Int'l
ALQ-78 countermeasure equipment	"	Loral Electronics Systems Div.
ASQ-81 (V) magnetic detection systems	"	Texas Instruments Inc.
AQA-7 (V) DIFAR	Nippon Electric Co.	Magnavox Government & Industrial Electronics Co.

ITEM	JAPANESE MANUFACTURER	LICENSOR
ARN-118 TACAN	Nippon Electric Co.	Gould Inc.
LTN-72 inertial navigation equipment, including digital data units	Toshiba	Litton Industries
APS-115B search radar	"	Texas Instruments Inc.
ACQ-5 data terminal equipment	Hitachi Ltd.	GTE Sylvania Inc.
URT-26 (V) crash locator	Fujitsu Ltd.	Ray Co.
AWG-19 missile control systems	Mitsubishi Heavy Industries Ltd.	McDonnell Douglas Corp.
ASA-64A magnetic signal processing systems	Shimadzu Ltd.	CAE Industries Ltd.
RO-32/ASQ magnetic recorders	"	Emerson Electric Co.
APN-187 or APN-227 Doppler radar	Mitsubishi Precision Co.	Singer Co. or Canadian Marconi Co.
APX-76 interrogator	Toyo Communication Equipment Co.	Hazeltine Corp.
APX-72 IFF	"	"
RO-308/SSQ-36 recorders	Oki Electric Co.	Weston Instruments Div., Sangamo-Weston Inc.
ID-1872A underwater noise level indicator	"	NAFI
AGC-6 teletypes	"	ECI Div., E-Systems Inc.

ITEM	JAPANESE MANUFACTURER	LICENSOR
APN-194 radio altimeters	Japan Aviation Electronics Industry Inc.	Honeywell Inc.
R-1651 sonobuoy indicator, including controlling equipment	Japan Radio Co.	Texas Instruments Inc.
ARN-99 Omega navigation equipment	Furuno Electric Co.	Northrop Corp.
ARC-161 HF radio	Kokusai Electric Co.	RCA
CU-2070/ARC control equipment	"	Sperry Marine Systems, Sperry Rand Corp.
AIC-22 interphone systems	Nagano Japan Radio Co.	Telephonics Corp.
AQH-4 (V) 2 sono-data recorders	Ikegami Tsushinki Co.	Precision Data Inc.

CSO: 4120

ECONOMIC

BRIEFS

DELEGATION TO PARAGUAY--Tokyo Sept 12 KYODO--The government announced Friday that it will send a six-member delegation to Paraguay Sunday to help the South American country expand and modernize its telecommunication and broadcasting networks. The delegation headed by Tateo Iwata, counselor of the posts and telecommunications ministry, will stay in Paraguay for 17 days, according to a government spokesman. He said the delegation is going to Paraguay at the request of its government. [Text] [OW121241 Tokyo KYODO in English 0829 GMT 12 Sep 80]

CREDIT TO COLOMBIA--Tokyo Sept 12 KYODO--The Governmental Export-Import Bank of Japan will extend buyer's credit up to yen 3.26 billion to ICEL, Colombia's electric power agency. They signed the contract on Thursday for the syndicated loan by seven Japanese foreign exchange banks. It will be used for buying electric power equipment, including turbines and generators, and paying for services from Japan in connection with the project to expand a coal thermal power plant in Paipa, Western Colombia. This was the fourth buyer's credit extended to Colombia by Eximbank. [Text] [OW121241 Tokyo KYODO in English 0546 GMT 12 Sep 80]

AUSTRALIAN URANIUM MINING--Tokyo Sept 12 KYODO--Three Japanese electric power companies and a trading firm set up a joint venture in Tokyo Friday to acquire an interest in an Australian uranium mine. The new company, Japan Australia Uranium Resources Development Co (JAURDC), will channel money to development of the Ranger Uranium Mine in northern territory. Energy Resources of Australia Ltd (ERA), the Canberra-based operator of the mine, will, in return, provide the Japanese companies with an assured supply of about 1,000 short tons of uranium concentrates (yellow cake) a year for 15 years, beginning in 1982. The supply amounts to a third of Japanese present annual consumption. Jaurdc, capitalized at yen 4 billion (dollar 18.6 million), is owned 50 percent by Kansai Electric Power Co, 25 percent by Kyushu Electric Power Co, 15 percent by Shikoku Electric Power Co and 10 percent by C. Itoh and Co. [OW121245 Tokyo KYODO in English 0739 GMT 12 Sep 80]

AID TO SOLOMON ISLANDS--Tokyo Sept 11 KYODO--Japan will extend a grant totaling yen 2 million to the Solomon Islands for cultural cooperation, the foreign ministry announced Thursday. Notes to this effect were exchanged in Honiara by Takashi Sengoku, ambassador to Papua, New Guinea and concurrently ambassador to the Solomon Islands, and Denis Lulei, youth and cultural affairs minister of the Solomon Islands. With the Japanese aid, the islands will purchase equipment for physical education at schools such as track and field, softball, tennis, hockey and table tennis, officials said. [Text] [OW121245 Tokyo KYODO in English 0412 GMT 11 Sep 80]

RICE FOR MADAGASCAR--Tokyo Sept 12 KYODO--The government will export 20,000 tons of polished rice to Madagascar to help the country combat a food shortage, the food agency said Friday. The rice, priced at yen 99,000 per ton, will be shipped to Madagascar beginning next month, according to the agency. [Text] [OW121245 Tokyo KYODO in English 1155 GMT 12 Sep 80]

AID TO ZIMBABWE--Tokyo Sep 24 KYODO--Japan will provide Zimbabwe with a grant of yen 500 million for road network reconstruction in that country, the foreign ministry announced Wednesday. Notes to this effect were exchange Tuesday in Salisbury by Kunio Kamoshida, Japanese charge d'affaires, and Dr. Witness Mangwende, deputy foreign minister of Zimbabwe. [Text] [OW241114 Tokyo KYODO in English 0554 GMT 24 Sep 80 OW]

AID TO GUINEA--Tokyo Sep 24 KYODO--Japan will extend to Guinea yen 400 million in grant aid for improvement of transportation in that country, the foreign ministry said Wednesday. The ministry said notes to this effect were exchanged Monday in Conakry by Eiichi Honda, Japanese charge d'affaires, and Marcel Cros, secretary of state in charge of international cooperation of Guinea. Japan extended to Guinea a grant totaling yen 349 million in transport vehicles in fiscal 1978, officials said. [Text] [Tokyo KYODO in English 0638 GMT 24 Sep 80 OW]

AID TO SAMOA--Tokyo Sep 14 KYODO--The foreign ministry announced Wednesday that Japan will extend a grant totaling yen 14,500,000 to Western Samoa to purchase mobile library vehicles. Notes to this effect were exchanged Wednesday in Wellington, New Zealand, by Takashi Oyamada, Japanese ambassador to Western Samoa (concurrently ambassador to New Zealand) and Feesago S. Fepulea'i, Western Samoa's high commissioner to New Zealand. [Text] [Tokyo KYODO in English 0931 GMT 14 Sep 80 OW]

MITSUI BUYS SIX BELL 214BS--Mitsui and Co., Ltd., Japanese dealer and licensee of Bell Helicopter Textron announced at the Farnborough Air Show the purchase of six Bell Model 214B helicopters. The aircraft are being acquired for re-sale to commercial operators in Japan and will be used in electrical power construction projects and for general heavy-lift use. The six helicopters have been acquired for delivery later this year and in the first half of 1981. Making the announcement were Takeshi Tsukamoto, Mitsui senior executive managing director, and T. Hattori, general manager of Mitsui's aerospace division. The 214B has the best payload to empty weight ratio of any helicopter in the world. It can carry up to three and a half tons at a low operation cost. There are nine 214B's now operating in Japan. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 17 Sep 80 p 5]

CSO: 4120

RESEARCHER VIEWS TECHNOLOGICAL INNOVATION, FUTURE DEVELOPMENT

Tokyo Tokyo GEKKAN NIPA in Japanese Apr 80 pp 17-23

[Article by Tsutomu Sakamoto, research scholar, Nomura Research Institute of Technology and Economics]

[Text]

I. Preface

The 1970's in various senses was an extremely big turning point. To begin with, Japan's economy was forced to change from the advanced growth of the 1950's and 1960's to low growth because of environmental and pollution problems, and then restrictions on resources and energy. And with regard to the world economy, the 1970's was an era when IMF and GATT, organized following the end of World War II, were troubled, and economic frictions increased internationally. Besides, the 1970's was said to be a period of stagnation in technological innovation throughout the world. As for Japan's technological development, the 1950's and 1960's constituted a period of importing and digesting foreign technology, but from the latter half of the 1970's, Japan's technology rose to the top level of the world, and it can be said that the 1970's was the period when technological parity was achieved.

Thus the 1970's must be looked upon as having been an especially big turning point for Japan. What was the significance of this sort of turning point in Japan's technological development? Through a study of this matter, the outlook and problems for Japan's technological development and innovation during and after the 1980's and heading into the 21st century can be probed.

II. Outstanding Features of the 1970's

(1) Achieving Technological Parity

The significance of Japanese technology's having achieved parity with the top level of the world is indeed momentous. No longer can Japan import foreign technology onesidedly or seek development objectives from foreign technology. Accordingly, Japan's technological development hereafter must take the following two directions. One is to exert considerable effort to achieve original technological development like that of Europe and America. The other is, upon the birth of a new idea in Europe or America, to launch immediately into its development so as to establish an independent technology. This is the so-called 1.5-stage development.

Up until the 1960's in most cases Japan advanced technologically by importing technology that had been developed in Europe and America, and either improving or further developing this already developed technology, using it as the standard. This is the so-called two-stage development. The most outstanding feature of technological development in the 1970's lies in the fact that two-stage development had already become an impossibility and that [Japan] was forced to attempt 1.5-stage and single-stage development.

(2) The Conversion of Industrial Structures

At the beginning of the 1970's, "postindustrial society" and "technitronic society" were extensively used expressions. By postindustrial society is meant the conversion from the industrial structure centered on second-phase industries to the industrial structure which emphasized third-phase industries. Although the same meaning is applicable to the expression technitronic society, it probably includes the additional structural changes within second-phase industries. In other words, it means the conversion from second-phase industries centering on the heavy chemical industries to second-phase industries centering on the communication information and machinery industries.

The conversion of these two types of industrial structures occurred in the 1970's, and a higher progression in these conversions will probably be evident in the 1980's.

(3) Restrictions on Environment, Resources and Energy

The environmental problem became a reality around the end of the 1960's. The nation became very conscious of the limits of resources and energy during the 1970's, and this had a bearing on the technology of industries that heavily consumed resources and energy or that destroyed the environment. It was only natural to expedite pollution-prevention technology and the technological development of industries to conserve resources and energy. The direction of this technological progress will probably make greater strides hereafter. Moreover, as a reflection on giant technologies of the past, the use of intermediate technology or rational technology has been proposed. Just where this concept of intermediate technology will be placed in the scheme of things during the 1980's and 1990's will probably be one of the items worthy of notice.

(4) Increase in International Friction

International relations in the 1970s were heavily troubled by the unsteadiness of the IMF and GATT organizations, set up following the end of World

War II; the increase of international economic friction; the north-south confrontation, with the south gaining power; the friction between the resource-producing countries and the consuming countries; the added intensification of the East-West confrontation; etc. It is apparent that the establishment of a stable world order cannot be expected for some time to come. In the midst of this sort of intense atmosphere, it is only natural and necessary that the direction of Japan's technological development will undergo some sort of conversion. It will probably be necessary to boost Japan's technological power in order to strengthen its negotiating position with foreign countries and to maintain its guarantee for overall security.

(5) Joining the Ranks of Advanced Countries

Of tremendous significance to the Japanese is the fact that Japan became one of the world's most advanced countries in the 1970's. Japan achieved technological parity and at the same time became one of the world's most advanced nations. This is the result of the tremendous impact of Japan's economic influence, and it means that Japan must act in a manner worthy of its economic stature. If Japan is to become a member of the Western camp and nations of the free world, and if it desires to preserve these alliances, then it must exert efforts and assume obligations to this end. With this in mind, even as regards technological development, Japan in all likelihood will be strongly urged to share in assuming international cooperation and responsibility.

III. Unlimited Growth Capability of Information Technology

The conversion of the technitronic society which began in the 1970's was bolstered by the growth of communication information technology, and conditions wherein it can be called a true technitronic society will probably emerge during the 1980's and 1990's.

It was reputed that there was stagnation in technological innovation during the 1970's. This is because the 1970's was a big turning point in which technological progress, as an extension from the past, became stagnat and because development in a new direction was unclear.

Whereas the technological innovation of the 1950's and 1960's had centered around the heavy chemical industry, that of the 1980's and 1990's will certainly center on areas related to information. During the transitional period of the 1970's, it is reasonable to say that the principal industries were automobile and color TV manufacturing.

The information-related discipline differs from that of producing or processing "goods," and it is a discipline with unlimited hidden potential. And the technological progress of the information-related discipline today, beginning with the computer, has certainly made remarkable accomplishments.

But from the standpoint of the growth possibilities of this discipline, it must be observed that there is much more remaining--that this is only the beginning.

Information-related technology today is supported by electronics, but optoelectronics will probably become the principle in the 1990's. Then, with advances in life sciences in the 21st century, it may be that the information functions of living things and the mechanisms of similar objects may come to be utilized.

In any case, the greatest technological innovation forecast for the 1980's will probably be brought about by the microcomputer. The microcomputer of the 1980's will be a vast improvement over that of today, and when it is assembled in the midst of various machines and apparatus it will likely provide exceptional performance. This is the advent of the microelectronic revolution.

The information system, a consolidation of the communication system and the computer data base, will be further equipped so that a multifarious information system can be built, ranging from one large enough to be on a "world scale" to one small enough for private business, to advance the rationalization of the storage, processing, and transmission of information.

By further equipping this type of information system, office automation can be improved, and offices will probably be furnished with various types of terminal equipment, such as facsimile, etc.

On the other hand, homes in the 1990's will have popularized the video disc, home facsimile (electronic mail, electronic newspapers, etc.), image communication, and other equipment so that the technitronic society will have attained a state of completion.

As for all of the different technologies described above, their technological foundations have already been established, and many of them are in practical utilization. In this sense, some cease to be novel and therefore some people claim that these should not be referred to as technological innovations. However, the basic meaning of technological innovation does not have to do with the birth of a new technology, but with a technology that permeates society and continues to greatly revolutionize economic and social activity. In this sense, it should be observed that the 1980's and 1990's will be an era of technological innovation based on the growth and popularization of information technology.

IV. Promotion of Independent Technological Development

As described previously, Japan's technological development must convert from two-stage development to 1.5-stage development and further to single-stage development. But the problem focuses on the originality and creativity of the Japanese people. It cannot be denied that Japan's technological development until now lacked originality. But this was natural, because Japan was still a growing nation. Needless to say, for a backward nation to overtake advanced nations in the shortest possible time, the most effective way is to absorb the accomplishments of the advanced nations.

At the present time, when Japan is forced to convert from two-stage development to either 1.5-stage development or single-stage development, the question is whether Japan is ready or not.

In comparison with Europe and America, since the predisposition of Japanese society or organizations is strong on group orientation, it can be said that nurturing the concept of originality will be difficult. In this sense, it can probably be said that single-stage development is incompatible for most Japanese.

On this matter, Japan is rather in an advantageous position with 1.5-stage development in which the "buds of technology have sprouted" and the direction of development is clear enough to undertake development. This too is related to Japan's group orientation. That is to say, the Japanese begin to compete heavily in unison with the direction of development is just about defined in the development of a new technology. Then an intense competition develops and the result from the huge, concentrated outlay of energy is the accomplishment of an exquisite technological development in a short span of time. It can be said that this sort of phenomenon is rarely seen in Western countries, where originality is stressed.

Therefore, if Japan is to stop at 1.5-stage development, an extremely efficient development is possible and excellent results can be gained. More than in Europe and America, 1.5-stage development is suited for Japan, and it can be said that Japan's role is to nurture in Japan the "buds of technology that sprouted" in Europe and America.

However, this alone would mean that Japan would always be one step or a half step behind Europe and America. It would appear that even Japan should widely expand single-stage development in the 1980's and 1990's.

Japan's society and organizations emphasize collaboration more than originality. In order to effectively conduct original development in this sort of atmosphere, adjustments must be made with full awareness of the atmosphere.

The Japanese group orientation was a plus factor with two-stage development or 1.5-stage development. In other words, a development program having fixed goal, releasing concentrated effort in that direction and fulfilling the goal in a short span of time, is ideally suited for Japan's organizations. But the Japanese group orientation becomes a minus factor when it comes to single-stage development.

Therefore, when engaging in single-stage development, management of the development organization must bring in "visual points" which are different from those for 1.5-stage development, let alone for two-stage development. As to the biggest problem in Japan's technological development at present, doesn't it lie in the fact that, although Japan is already in need of single-stage development, the thinking of management has not changed since the days of two-stage development?

Along with the change in the times, new concepts in research and development management have also become necessary.

V. Development From an International Viewpoint

Japan achieved parity with the highly advanced nations in the 1970's; on the other hand, because of increasing international frictions, Japan may be forced to slightly alter its course from that of the other nations.

In the world today, technological strength is considered one of the important strategic resources of nations. So technological development in any country is an important political subject, and a fierce competition on technological development is being waged between highly advanced nations. Technological power is the foundation of economic power, and at the same time it wields tremendous political significance. It follows that international cooperation or collaboration has become essential, even with technological development. This is particularly important with technological development that is undertaken by the government, and although there may be degrees of difference in participation, the same principle applies to technological development for private industry.

Until now, Japan had imported the technology of Europe and America, or had taken the "bud of technology" from Europe and America to elevate its technological power in quick fashion. And Japan's technological power had quickly overtaken theirs, in some sectors even surpassing theirs, leading to the mounting criticism that Japan is getting a free ride with technological development. There is no denying that this situation definitely existed. And as long as Japan possesses the kind of mighty economic power that she has today, it is natural that this sort of free ride has become unacceptable. Furthermore, Japan must constructively participate in the common problems of the world with the Western countries who are charged with maintaining stability and growth.

Hereafter, the direction of Japan's technological development will be to assume an international posture and, while contributing to world prosperity, to pursue Japan's benefits within this framework. In concrete terms, this means contributing to such international topics as industrial control, energy problems and the north-south problem.

As described previously, Japan will achieve tremendous technological progress in information technology during the 1980's and 1990's, and she will probably achieve technological innovations that will surpass and not be inferior to those of the 1950's and 1960's. Information technology can obtain excellent results, even with the performance based on the economic principles of private industry. But this is possible only after Japan's overall security (physical, economic, and political security) is guaranteed.

On the other hand, Japan must not forget technological developments that relate to the guarantee of overall security, which is not achievable through pursuit of economic principles alone. Subjects that are directly related to the guarantee of overall security include food, energy, and defense. It is definitely impossible for Japan to fully sustain all of them with her own power, and so she cannot help but pursue them with the internationally established, mutually dependent organizations.

In these areas, Japan's contribution of food would be minimal. On defense, it is true that other countries have exerted tremendous efforts and have assumed large burdens. Even if Japan does not heavily increase its defense strength, she will probably be asked to assume a comparable share with defense technological developments.

Japan's most positive contribution in the guarantee of the world's overall security would be in the area of energy. Energy technological developments would require an enormous amount of capital and much time, so international cooperation is indispensable. The development of energy technology is not only important from the standpoint of Japan's guarantee of security, but it is considered to be Japan's most effective area in her contribution to the world through exploitation of her technological and economic strength. Japan's international responsibility will be to undertake the development of energy technology with greater fervor during the 1980's and 1990's.

In passing, the subject of energy technology as the core of technological innovation for the 1980's and 1990's was not taken up in this article. This is not because no progress in energy technology can be expected during these periods. Rather, tremendous technological progress can be expected. If the term technological innovation, as defined previously, is to be considered on the basis of the qualitative influence exerted on economics or society, then it was appraised that the influence of energy technology will be extremely small in comparison with that of information technology.

The 1970's Effective Role of Intermediate Technology was a period to reflect on the gigantic technology systems. This led to the outcry for the need for technology assessments. The proposals for intermediate and rational technologies were made as a result of these assessments. In comparison with the gigantic technologies of the past, these were proposals of small-scale technologies that harmonized more naturally and adapted more closely to the locale. If the gigantic technologies of the past are considered to be heavy consumers of resources and the environment, then the concept of intermediate technologies cannot be ignored. The role of intermediate technologies will increase in the 1980's and 1990's, and they will probably occupy a part of technological innovation, giving it a new meaning.

Intermediate technologies should not be competitively considered against gigantic technology systems in the scheme of things, but a harmonious combination must be sought wherein the merits of both are maximized and shortcomings are mutually corrected.

For instance, by organically blending solar energy into an existing energy system, its true value can be derived. By the same token, blending the energy systems to process city waste or stored waste can probably result in progress.

It can be said that the idea of fusing intermediate technology with existing technology in this manner may be one of the special characteristics of technological innovation in the 1980's and 1990's.

VII. Conclusion

It was strongly theorized at the end of the 1970's that technological innovations would stagnate in the 1980's. Certainly if seen as an extension of technological progress of the 1950's and 1960's, it appeared that technological innovations would stagnate. But during that period the quality of innovation gradually underwent a change. That is to say, the change was from innovation based on "goods" to one based on "information." The changes in innovation based on "goods" was spectacular and obvious, but the innovation based on "information" advanced because it was not seen. The influnces information revolution forecast for the 1980's and 1990's will probably appear in areas unexpected by society. At a time when qualitative changes are occurring throughout the world, the fact that the direction of technological development is undergoing great changes must not be overlooked.

9510
CSO: 4105

NEW HIGH-SPEED HOMING TORPEDO FOR MSDF

Tokyo JPE AVIATION REPORT-WEEKLY in English 17 Sep 80 pp 8,9

[Text]

The Technical R&D Institute (TR&DI) of JDA has requested appropriations of ¥4,540 million in FY 1981 for continued development of the G-RX2 long-range homing torpedo for the Maritime Self-Defense Force (MSDF). The TR&DI and the MSDF plan to place it in service around 1985.

The TR&DI has been working on the high-performance G-RX2 over the past five years. The G-RX2 will be able to home on a target by detecting and identifying the underwater sound wave it produces.

The TR&DI will shortly award a contract to Mitsubishi Heavy Industries Ltd. (MHI) for full-scale development and fabrication of the G-RX2. A prototype torpedo will be completed in FY '83. Extensive operational tests will follow in FY '84. The torpedo will enter service with the MSDF in 1985 - 86 if tests prove successful.

The G-RX2 reportedly travels at a speed of approximately 60 knots and its range is about 1.2 to 1.3 times greater than conventional torpedos although details of the design and specifications are classified. The homing performance of the G-RX2 is reportedly superior to that of the US Navy Mark 48 torpedo, Japanese defense sources report.

General design work on the liquid propulsion system and the war head of the torpedo has almost been completed and the homing head, the most important part of the weapons system, will be developed in FY '81.

Japan's technical level concerning torpedoes which is still behind the US and other advanced military powers will reach advanced levels when the G-RX2 is completed, local defense sources say.

CSO: 4120

BRIEFS

NEW COMPUTER SYSTEM--Tokyo Sep 23 KYODO--A new computer system claimed able to listen to telephone orders and transcribe books in braille has been developed, government officials say. The pattern information processing system has the functions of the human eye and ear, they say, and can provide avenues of processing spoken, printed, hand written and other information. The new system has been developed by the Ministry of International Trade and Industry's Agency of Industrial Science and Technology. With a built-in, high-density LSI developed by the agency, the computer can among other applications, take orders through telephone for train seat reservations, the officials said. Unless the customer has an excessively strong accent, he can talk to the computer and book a seat in a second, they said. A test run on programming of nine selected themes will continue between October and March. The agency has applied for patent rights on some 500 technical achievements associated with the development of the computer. [Text] [Tokyo KYODO in English 0622 GMT 23 Sep 80 OW]

COMPUTER MEMORY MASS PRODUCTION--Tokyo 25 Sep KYODO--Nippon Electric Company (NEC), Japan's leading Integrated Circuit (IC) maker, said Thursday it would start late this month mass production of the 64k computer memory. NEC said output of the memory will amount to 40,000 to 50,000 units a month initially. But the monthly output will increase to 100,000 units next spring, it added. Compared with the 16K memory, the large-scale integration (LSI) now being widely used as the best computer memory, the 64K memory has a storage capacity four times larger, NEC said. The data processing speed is the same but consumes about 50 percent less electricity than the 16K memory. The 64K memory will initially sell for yen 22,000 but the price is expected to be reduced to less than yen 5,000 in 1983, according to the company. NEC said the 64K memory will be the mainstay computer memory in 3 years. [Text] [OW251039 Tokyo KYODO in English 0406 GMT 25 Sep 80]

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JAPAN REPORT

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ECONOMIC

ECONOMIC PLANNER ON CONSUMER PRICES

OW140039 Tokyo KYODO in English 0018 GMT 14 Oct 80

[Text] Tokyo Oct 14 KYODO—Consumer prices, although showing signs of calming down, were still high when compared with last year's levels, director general Toshio Komoto of the Economic Planning Agency said Tuesday in announcing a monthly economic report.

He also pointed out that business was continuing to show signs of slowdown with personal spendings slackening and production and shipments declining.

The government announced a new comprehensive economic package on September 5 in which it switched course to one laying equal emphasis on both prices and business in steering the economy from the one laying stress only on prices.

Government economic policy planners are now watching the effects of the package.

But since the increase in consumer prices in September was higher than expected, they are being pressed with the need to take additional steps to curb inflation.

The government is planning to draw up a concrete plan during this month to cope with the continuing consumer price increases, EPA officials said.

The monthly report submitted by Komoto to a meeting of cabinet ministers concerned with economic affairs said:

--plant and equipment investments and exports were on the uptrend as the tempo of business expansion remained slow due to dull personal spendings. Production and shipments also were decreasing.

--wholesale prices tended to calm down as some commodity prices were falling. Consumer prices also were on the downtrend but remained still high when compared with the levels a year ago.

--to cope with such a situation, the government will enforce the eight-point package decided last month to stabilize prices and maintain the growth of the economy.

--as for the economic situation abroad, the decline in business activities in the U.S. is believed to have come to a halt. But business in West European countries generally was showing signs of declining. Although the upsurge in prices was slowing down, they still remained relatively high.

CSO: 4120

ECONOMIC

JAPAN HAILS PETRODOLLAR INVESTMENT

London 8 DAYS in English 4 Oct 80 pp 30-31

[Article by Koji Nakamura]

[Text] AT LEAST 50 per cent of the estimated $54bn worth of yen assets held by foreign sources is now believed to be petrodollars. The newly revealed figures, available from Japan's ministry of finance and international monetary sources, far exceed earlier estimates that the total amount of petrodollars in Japan was $10bn. The more recent petrodollar performances in Japan indicate a substantial rise since July.

The sharp growth of yen assets, according to these sources, is attributed to active investments on the part of oil-producing countries in the stock and bond markets, as well as to inflows from pension funds in the US and the UK.

Such an active inflow of petrodollars into the stock and bond markets from oil-producing countries (mostly Middle Eastern), will generate considerable changes in the structure of the yen assets held in Japan. Before June, 45 per cent of assets were held in bank deposits, 20 per cent in the bond market, 15 per cent in the stock market and the rest in real estate and other concerns. Market sources now estimate that the stock and bond market shares will soon exceed bank shares.

At the end of August, monetary sources estimated that investments into securities and bonds left a surplus balance of $27bn-$28bn, which accounted for an increase of $6bn since the turn of the year. The bulk of net increase was mostly due to Kuwait, the biggest investor in the stock market, Saudi Arabia — which had concentrated on the bond market rather than securities, but which has stepped up stock market operations of late — the UAE and Qatar and Iraq to a certain extent.

The attention of stock market operators has been attracted recently by the heavy volume of shares which these countries have started purchasing. The purchase unit per order is now two million shares. They have bought stock in Nippon Steel, Tokyo Shibaura Electric (Toshiba) and Hitachi Limited, among others.

Apart from these investment performances, which have been mostly channelled through London securities dealers, one recent development left the stock market bewildered. This was the acquisition of 256.7m shares in 11 leading industrial firms by the Swiss Credit Bank (SCB), said to be the third largest bank in Switzerland. It is mainly engaged in the recycling of surplus petrodollars acquired by oil-producing countries. The bank has recently demanded 'transfer of ownership' of these shares.

While the share the bank holds is 'minimal' considering the total number of shares issued, the SCB is now the seventh largest shareholder of Hitachi Limited, with 55m shares or 2.1 per cent. It is thought that the bank might become the fourth largest holder, with 70m shares, when the current procedure for transfer of ownership of 15m newly acquired shares is completed.

The bank is also the tenth largest holder of Kubota Iron Works and Asahi Glass, with 35m shares (2.7 per cent) and 22m shares (2.5 per cent) respectively.

The 256m shares the SCB holds compares with the 156m shares which oil-producing countries, including non-Arab states, held in 1979 when total foreign investments in the stock market stood at 0.14 per cent of the total current value of stocks issued by those listed at the stock exchanges of Japan as of April, 1980.

Some $600m to $800m of the $1bn net increase in foreign investments into the stock market in August are believed to be Arab-based liquidities. Stock market sources said that the SCB's performance 'clearly endorses' recent reports from IMF sources that Arab oil-producing countries have 'reassessed' the Japanese stock market as a major outlet of surplus petrodollars (estimated at $120bn in 1980) and have raised the 'Japan quota' from 2 or 3 per cent to 10 per cent.

Executives of the firms involved have welcomed the growing 'Arab presence' in their corporate stock structure. They commented that the situation signifies 'increasing Arab confidence in us', and expressed belief that the active Arab acquisition of their corporate shares was 'not aimed at either management participation or takeovers'. Foreign possession of Japanese corporate shares is legally limited to 25 per cent of the total.

Another sector where petrodollars have grown rapidly is the so-called 'free yen' accounts of foreign exchange banks. The $4bn balance at the end of 1979 had increased by an estimated $1.2bn by the end of August this year.

No less active is the so-called Euroyen market, where the estimated $10bn balance at the end of 1979 has increased to $14bn. The acquisition of Certificates of Deposits (CD) and Euroyen bonds have also contributed to the build-up of yen assets by non-residents.

The Japanese government recently dispatched a mission to the Gulf states to lay the basis for these countries to purchase bonds, a selling effort aimed not only at Middle Eastern governments but also at private firms.

Already, the Bank of Tokyo, the Long Term Credit Bank of Japan and Sumitomo Bank have sold an estimated Japanese yen 100bn worth of national bonds to Iraq, Saudi Arabia, Kuwait and the UAE. Saudi Arabia is also purchasing $200m worth of national bonds directly from the Bank of Japan each month.

For a country which is faced with a current account deficit of $13bn in 1980 ($10bn in 1979), and which will have to pay more than 60 per cent of the anticipated $12bn trade receipts, the inflow of petrodollars is a major supply of foreign currency reserves, which have now regained the $23bn level.

The following is a table of the SCB's holding of Japanese firms

(Figures in parentheses are the share against the total shares issued)

	Million	%
Hitachi Limited	55	(2.1)
Nippon Steel	40	(0.6)
Kubota Iron Works	35	(2.7)
Mitsubishi Electric	23.5	(1.7)
Asahi Glass	22	(2.5)
Tokyo Shibaura Electric (Toshiba)	20	(0.9)
Sanyo Electric	16.2	(2.0)
Matsushita Electric	13	(1.1)
Nissan Motor	12	(0.8)
Mitsubishi Chemical	10	(1.0)
Fujitsu	10	(1.3)

CSO: 4120

SECOND INTERIM REPORT ON AIRCRAFT INDUSTRY POLICY

Tokyo JPE AVIATION REPORT-WEEKLY in English 24 Sep 80 pp 1-6

[Text]

The Aircraft Division, Aircraft & Machinery Industry Council, MITI, has published its second intermediate report on Japan's aircraft industry policy. This was the basis for MITI's FY 1981 budget request submitted in August, in which the ministry requested research funds for the Y-XX medium transport development program and financing airlines' purchase of Boeing 767s.

A translation of the intermediate report follows:

The aircraft industry must play an important role in the national economy. However, aircraft development and marketing usually involve financial risks. This risk factor forces the government to take a major part in development of the industry.

Japan's aircraft industry policy should be based on the following recommendations:

1. Aircraft Technology Research

Basic and practical research on aircraft technology promotes not only the technological level of the aircraft industry and its development but also the level of the nation's technology. The following points should constitute the base for research:

(1) Promotion of Practical Research

Japan's basic research on aircraft technology mainly at governmental institutes has made substantial progress, however, further promotion is necessary. As for practical research for application of basic technology to aircraft development, Japan is behind the United States and other developed nations. Emphasis should be put on research for practical utilization of advanced technology.

The private sector should undertake such practical research because this type leads directly to aircraft development. However, the research costs so much and is a financial risk to the private sector, because application of research to actual aircraft development is not guaranteed. Therefore, the government should take the leadership in practical research while utilizing the private sector's ability.

SJAC's establishment of an advanced aircraft technology development center in FY 1980 is a favorable move. It will be desirable to expand the center in the future.

(2) Promotion of Test and Research Equipment

To step up practical research, wind tunnels and other equipment for tests and research should be increased. Equipment needed for an immediate increase includes numerical test simulators (large computers for numerical analysis), large transonic and other wind tunnels, operation simulators, large acoustic fatigue test systems, environmental test equipment for jet engines, and large elementary test systems.

Equipment for both basic and practical research should first be increased at the Science and Technology Agency's NAL. Private firms' joint test equipment would then be considered.

2. Development and Production of Commercial Aircraft

Since development, production and marketing of commercial aircraft are the foundation of the aircraft industry, the government and industry should promote the ongoing Y-X (Boeing 767) and XJB (RJ500) Anglo/Japanese aero engine programs while proceeding positively with new programs like the Y-XX project. Future aircraft development, production and marketing should be based on the following policies:

(a) Development, Production and Marketing Risks

Aircraft development, production and marketing risks are covered by semigovernmental companies in European countries and by private companies in the United States.

In Japan, the government has founded NAMCO jointly with private firms for the YS-11 program to cover the greater part of development, production and marketing risks. In the Y-X program, government loans are being given to CTDC to cover development risks. Production and marketing risks are the responsibility to private companies.

In future aircraft development, production and marketing programs, production and marketing risks should be covered by private companies. This would utilize the energy and efficiency of the private industry which has supported Japan's postwar economic growth. However, development risks, which are extremely high, should be shared by the government and private companies. The government's extension of loans and subsidies is desirable.

As for future programs proposed by the government, all development, production and marketing risks should be covered by the government.

(b) International Collaboration

International collaboration is being increasingly adopted for aircraft development. Examples include the Japan-U.S.-Italy Y-X (Boeing 767) program and the European Airbus project. Japan also should collaborate with other nations in future major programs so as to disperse technical and marketing risks and development funds and to secure markets.

(c) Central Organizations for Aircraft Programs

Aircraft development, production and marketing should be undertaken by individual aircraft manufacturers in principle. However, it is difficult for individual firms to carry out big projects such as the Y-X and XJB programs. Intercompany collaboration is necessary for such programs. In this case, companies must set up central organizations to coordinate different plans of individual firms. In international collaboration, such organizations are necessary to unify ideas of the entire Japanese aircraft industry.

Japan has so far set up NAMCO for the YS-11 development, production and marketing, and CTDC for the Y-X (767) development as such central organizations.

NAMCO was established in 1959 under the Aircraft Industry Promotion Law to develop, produce and market Japan's first commercial transport, the YS-11. Since YS-11 production stopped in FY 1973, NAMCO has been engaged in supply and product support and other business. This support will have to be continued as YS-11s are expected to be operational over the next 15 years. However, its cumulative deficit had risen to slightly less than ¥7,000 million at the end of FY 1979. Its income cannot cover expenses at present, and therefore, its deficit will continue to increase. Measures should be taken to cope with this situation as quickly as possible.

CTDC now undertakes development of the Y-X. However, some quarters have expressed doubts about its engagement in production of the aircraft. CTDC founders will have to reconsider the organization's business after production starts.

(d) Financial Source for Loans and Subsidies

The government must secure the source for large loans and subsidies in order to promote future commercial aircraft development. The source should be the general account because promotion of commercial aircraft development usually leads to technology spinoff in Japan's industry and eventually benefits everyone. Some recommend special accounts be set up for such special aircraft as flyingboats and STOL planes. This opinion should be further studied as establishment of new special accounts involves several problems.

(e) Government Loans and Subsidy Extension Formula

In aircraft development programs, design and schedules are frequently changed because of technical reasons and market trends. This results in a fluctuation of the amount of development funds needed. Therefore, a formula should be adopted for appropriating government loans and subsidies flexibly in response to actual progress.

3. Commercial Aircraft Trade

It is difficult for Japan to develop aircraft only for its domestic market. To make aircraft development programs profitable, Japan has to depend on foreign markets for the majority of sales. This calls for promotion of smooth international trade in commercial aircraft. The trade should be based on following policies:

(1) Promotion of Free Trade

The commercial aircraft trade agreement has been established as part of the GATT Tokyo Round agreements for freer world trade. This envisages international aircraft sales based on the principles of free trade.

The Japanese government has neither imposed restrictions on aircraft imports for protection of the domestic industry nor intervened in introduction of foreign aircraft. In some countries, governments have concluded so-called offset contracts with foreign nations under which domestically-produced components must be used for aircraft imported from abroad. This is not the case with Japan.

Promotion of free trade principles will contribute to development of the world's commercial aircraft industry. Therefore, Japan should strive to maintain and develop a free trade setup on the basis of the GATT agreement.

(2) Dollar-based Export Financing Systems

Every country extends governmental export credits for commercial aircraft because they are frequently key terms in aircraft export deals. European nations as well as the United States have dollar-based public export financing systems since the world's aircraft trade is settled mainly in that currency. However, Japan maintains only yen-based financing systems.

In proceeding with international aircraft development programs, participating nations will furnish dollar-based export credits to aircraft purchasers according to the countries' aircraft production shares. If Japan has no dollar-based export financing systems corresponding to those of aircraft development partners, smooth aircraft marketing will be affected to the disadvantage of Japan. Therefore, Japan should set up dollar-based export financing systems to cover its share in joint aircraft production with foreign partners. If foreign countries attach special incentives to export credits, Japan should take measures that would correspond with them.

(3) Commercial Aircraft Import Financing Systems

Japanese airlines use aircraft-exporting countries' export financing systems to purchase of commercial aircraft unless the government takes special measures to promote imports. For export of aircraft developed jointly by Japan and foreign countries, however, the foreign partners are expected to let export financing systems cover only costs corresponding to their production shares. In that case, aircraft costs for the Japanese share would not be subject to the foreign partners' export financing systems. This would make Japanese airlines' purchase of jointly-developed aircraft disadvantageous to import of aircraft developed wholly by foreign countries. For Japan-participated international aircraft development programs, Japan should establish public financing systems to cover Japan's development and production share.

(4) Aircraft Industry and Defense

Every country sees the aircraft industry as an important part of its defense industry. Every government provides funds to the aircraft industry for development, production and research of military aircraft. Under these circumstances, military aircraft account for the greater part of sales of the aircraft industry. The Japanese aircraft industry's dependence on defense is especially high. In 1979, military aircraft captured as much as 86 percent of the aircraft industry's sales in Japan.

The government should further promote domestic production and research and development of Self-Defense Forces' aircraft to help upgrade the defense-oriented aircraft industry.

Although cost and performance requirements for commercial and military aircraft are different, development and production techniques are closely related. Therefore, research and development of commercial and military aircraft should be carried out in tandem.

CSO: 4120

AEROSPACE PRODUCTION TO DIP IN FY '80

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 pp 1,2

[Text] Japan's aerospace industry production in FY 1980 started last April will decline slightly from FY 1979, although exports and order receipts will increase, according to a survey by the Society of Japanese Aerospace Companies (SJAC) covering 30 major aerospace firms.

The value for the current fiscal year is projected at ¥287,700 million, down 2.2 percent from ¥294,300 million in FY 1979. Of the total, aircraft account for ¥94,200 million, down 2.5 percent; engines ¥34,700 million, down 2.6 percent; parts ¥102,500 million, down 0.2 percent; and equipment ¥56,100 million, down 5.2 percent.

Exports during the year are expected to increase 62 percent from ¥13,900 million in FY 1979 to ¥22,500 million. The FY 1979 figure was almost the same as FY 1978. Aircraft exports are expected to increase 117 percent to ¥10,400 million and parts 40 percent to ¥11,500 million. However, equipment is projected to decline 36 percent to ¥600 million.

Orders to be placed with the Japanese aerospace industry in FY 1980 are expected to increase 75.5 percent to ¥549,900 million from ¥313,200 million in FY 1979. The FY 1979 figure represented a 13.5 percent drop from ¥362,300 million in FY 1978. In FY 1980, aircraft orders are projected to rise 187 percent over the previous year. Manufacture orders cover 264 aircraft and repair orders 402 aircraft. Engines are expected to increase 193.9 percent to ¥98,800 million. Engine orders comprise 170 units for manufacture and 985 units for repair. Equipment orders are seen rising 40.9 percent to ¥84,300 million, while parts are expected to drop 13 percent to ¥115,600 million.

CSO: 4120

NAL TO INCORPORATE ADVANCED TECHNOLOGY INTO STOL AIRCRAFT

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 pp 2,3

[Text]

The National Aerospace Laboratory (NAL) has started fabrication of a control system for experimental fan jet STOL (short takeoff and landing) aircraft. NAL plans to incorporate in the plane the stable control augmentation system (SCAS), inertial navigation system, triple servo system, head-up display, fly-by-wire technique and other advanced technology. It has also begun research into head-down display and optical fiber transmission technology for future STOL aircraft.

The application of such advanced technology is a first in Japan. Great expectations are placed on the experimental STOL aircraft to display Japan's development of the advanced technology.

It will be very difficult for pilots to control STOL aircraft because the aircraft are designed to take off and land at very low speeds and they are also vulnerable to strong winds. To cope with these problems, a SCAS will be mounted on the experimental aircraft. This system has functions such as maintenance of speed, attitude control, automatic trimming, side slip control and flight route adjustment.

CSO: 4120

REPORT URGES PROMOTION OF AEROSPACE MACHINING TECHNOLOGY

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 pp 3-5

[Text]

The Association of Mechanical Technology in its report on aerospace industry technology urges the local aerospace industry to promote research and development of machining technology.

According to the report, commissioned by the Japan Machinery Association, machining technology is especially important to the industry at a time when new aircraft materials are being developed to reduce weight and conserve fuel.

Research and development should include establishment of design processes, development of new materials, improving currently used materials, and improvement and development of machining technology. New machining technology and tools are necessary for integral structure, honeycomb structure, and utilization of composite and reinforced materials.

Regarding machine tools for airframe production, the industry is going ahead with promotion of numerical control (NC), rigidity, driving power, control systems, reliability and safety, chip ejection, bonding techniques, treatment of composite materials, diffusion and bonding techniques and technology for forming large components. Specifically, improvement of skin and spur millers and higher rigidity of multi-spindle NC machine tools are receiving priority.

In production of aero engines, the industry is handling establishment of cutting and grinding data banks, tool holders and machining equipment, and development of special machining processes. In order to improve engine assembling processes, the industry is also studying ways to upgrade automation, and development of NC tools and assembly technology using no metallurgical tools.

The United States' machining technology for the aerospace industry is considerably advanced. CAD (computer aided design) and CAM (computer aided machine) are fully utilized for production of airframes. Computers are widely applied to all airframe production processes from planning through tooling and fabrication. New bonding techniques are being introduced to reduce weight along with machined skin. Numerical and adaptive controls are used for machining complex-shaped components.

Engine machining equipment in Japan is not inferior to that in the United States. However, the Americans are using metallurgical tools more efficiently than the Japanese. The tools are also adjusted to mass production. Research and development of machining technology in the US are far more advanced than in Japan. Development of new machining technology is being adapted to new engine materials. Taking the US technological development into consideration, the government should subsidize research and development in this field.

US machine tool manufacturers have close relations with aircraft companies so that tools are fully adapted to aircraft production processes. Japan should learn from this relationship. US aircraft manufacturers are also cooperating fully with subcontractors as in the Japanese automobile industry. There is a high possibility of Japanese machine tools being introduced to the US aircraft industry.

The association has selected specific research and development subjects especially for airframe production, including establishment of bonding technology, development of computerized NC layup tools, improvement of adaptive control systems, establishment of technology for cutting and grinding rigid materials, highly-accurate gear machining, spline machining technology (broach and alternative processes), large tool grinders and measurement systems, development of NC machine tools with measurement functions, techniques against heat deformation, development of general-purpose chucks, development of automatic assemblers, and measures against chips produced during cutting.

The association has made guidance specifications for adaptive control machine tools, automatic layup and other tools machining composite materials, and NC machine tools with measurement functions. It will study these specifications and measures against chips next year.

CSO: 4120

FIRM COMMITMENTS FOR MITSUBISHI MU 300 EXCEED 100

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 p 5

[Text]

Mitsubishi Heavy Industries Ltd. (MHI) and its Dallas-based American subsidiary Mitsubishi Aircraft International Inc. (MAI) had received firm commitments for 101 MU300 new business jets by the middle of September, MHI sources have revealed.

The MU300 is a turbofan successor to the MU2 turboprop, 658 of which were ordered as of the end of August. The MU2 which Mitsubishi began marketing 15 years ago is now selling at the rate of five to ten aircraft monthly.

At the end of August, MHI and MAI had received firm commitments for 94 MU300s. MAI sold another seven to American operators during the first half of September, increasing the orders to 101.

The MU300 is now in the final stage of its flight test program and is scheduled to be certified by the US FAA in early 1981.

CSO: 4120

LICENSING CONTRACTS ON AIRBORNE EQUIPMENT

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 pp 5,6

[Text]

*F-15

Mitsubishi Precision Co. has reached agreement with SCI System, Inc. of Huntsville, Alabama on local production of integrated CNI control panels of the ASDF/McDonnell Douglas F-15J and -15DJ fighter aircraft under the second production contract to be funded this fiscal year. Mitsubishi Precision will begin preparations as soon as the agreement is approved by the Japanese government.

*P-3C

Shimadzu Ltd. is negotiating with CAE Industries Ltd. on a licensing contract for local production of ASA-64A magnetic signal processing systems for ten MSDF/Lockheed P-3C antisubmarine aircraft which will be funded in FY '80. Shimadzu plans to sign a contract in October.

The company will also produce the Emerson Electric RO-32/ASQ magnetic recorders for the aircraft. It is producing the same equipment for the MSDF P-2J aircraft and only a modification to the present contract will be required, sources say.

Shimadzu already has licensing contracts with EPSCO Inc, Westwood, Ma., Garrett Corp. and CAE Industries Ltd. on local production of signal converters, airspeed instruments and automatic magnetic compensation systems respectively for the first MSDF P-3Cs funded in FY '78.

CSO: 4120

FOKKER PUSHING JAPANESE ON F-29

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 1, 2

[Text]

Chairman F. Swarttouw, F-29 Project Manager J. Cornelis, and two other senior executives of Fokker Aircraft Co. were in Tokyo toward the end of September, to contact top leaders of the Japanese aircraft industry and the Ministry of International Trade and Industry (MITI).

Swarttouw and his party met top executives of Japanese aircraft manufacturers --- Kenji Ikeda of MHI, Teruaki Yamada of KHI, Twao Shibuya of FHI and Eiichi Yamaguchi and Kenji Uchino of the Civil Transport Development Corp. (CTDC) in Tokyo Sept. 24 and reportedly proposed that a new medium size passenger aircraft, coded here as the Y-XX, be developed and produced by Fokker, Boeing and the Japanese industry on an equal basis. Fokker has also proposed development of the aircraft begin in the middle of 1981 so that production can start in 1987 - 88, the report said. Fokker apparently explained details of the proposal and questions and answers were given on precise issues as the meeting lasted for five hours.

Swarttouw and the other Fokker executives were in Seattle, Washington, in the middle of September, for discussions with Boeing officials prior to visiting Tokyo.

The Fokker leaders met Minister Rokusuke Tanaka, Director-General of Machinery and Information Industry Bureau Shohei Kurihara and Director of Aircraft and Ordnance Section Yoshihiro Sakamoto at MITI Sept. 25 and briefed them on Fokker's proposal and requested Japan to give a positive response. This was the first time for Swarttouw to meet Tanaka after inauguration of the Suzuki Cabinet in July.

Although details of the discussions between the MITI officials and the visiting Fokker executives are unknown, the Japanese officials reportedly refrained from making any positive commitments. Tanaka told Swarttouw that the Japanese industry and the government were also in contact with Airbus Industrie and Boeing Commercial Airplane Co. in connection with joint development of the Y-XX, and that the Japanese want to study details of their respective plans as well as Fokker's proposal, and that Japan is still open for further discussions, one source said. After the meeting with Tanaka, Swarttouw and his party continued discussions with Kurihara and Sakamoto at MITI behind closed doors.

Swarttouw and his party told the Japanese industry and government leaders that Fokker is also in contact with Airbus Industrie on new aircraft development, but that talks with Airbus were not progressing as well as those with Boeing, according to Japanese industry sources.

When Japanese industry leaders visited Seattle in August, they met high-level officials of Boeing and discussed with them various joint development possibilities acceptable to both sides, local industry sources say. How Boeing will respond to Fokker's proposal made during their meeting in Seattle in the middle of September may be interesting to the Japanese.

CSO: 4120

R&D SUBJECTS FOR SJAC TECHNICAL CENTER

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 3,4

[Text]

The Planning Committee of the Advanced Aircraft Technology Development Center, Society of Japanese Aerospace Companies (SJAC), has drafted recommendations on the center's survey of foreign advanced aircraft technology, a long-term plan for research and development of advanced aircraft technology, and research and development plans for FY 1980 (April 1980-March 1981).

The committee, headed by Hiroshi Nakaguchi, was asked to prepare recommendations on the three subjects and commission research and development for FY 1980 by Prof. H. Kimura, director of the center. A report on the last subject will be submitted later.

A gist of the report follows:

1. Foreign Advanced Aircraft Technology Survey

The center will commission appropriate institutes to survey research and development of airframes, powerplants and control systems in the United States and Europe, including Britain, West Germany, France, Italy and the Netherlands.

2. Long-term plan for R&D of Advanced Aircraft Technology

Considering future aircraft requirements, R&D activities in Japan and the world, and promising R&D projects, the committee selected 77 R&D subjects--15 on improvement of efficiency in navigational systems, 16 on increased safety, 36 energy conservation and 10 pertaining to environmental issues:

Improvement of efficiency in navigational systems: Marketing, product support, production control, basic planning technology, rationalization of design, development tests, increased airport efficiency, new systems for new aircraft, radio navigation systems, helicopter blades, powered high lift devices, vertical takeoff and landing, analysis of large structures, electronic fuel controls, and intensive electronic navigation controls.

Improvement of air traffic safety: Reliable maintenance, adjustment of maintenance processes to systems design, more data concerning air traffic and environmental requirements, wind shear and vortex detection systems, direct lift control, non-destruction testing, damage-covering design processes, strengthened aluminum alloys and processing, engine surveillance systems, engine integration technology, fly-by-wire systems, automatic and microwave landing systems, flight stability systems for helicopters, air bearing, anticollision systems, and integration of display systems.

Energy conservation and alternative energy sources: Improvement of simulators, basic plans for more fuel-efficient aircraft, transonic wings, reduction of interference in wings and fuselages, wing tips, variable geometry wings, long nacelle, boundary layer suction, stability relaxation, operational load control, gust-load control, flutter control, mechanical high lift device bonding structures, integral structures, composite materials and their processing, reinforced plastic processing, high speed propellers, variable pitch fans, core engines, reducing weight, heat reproduction systems, hydrogen fuel aero engines, heat-resisting materials, composite materials, electric power packs, light power distributors, variance power-by-wire systems, high-pressure hydraulic devices, energy saving navigational systems, accurate navigation and automatic navigation systems, etc.

Environmental issues: Basic plans, quieter navigational systems, anti-air pollution measures, reduction of internal noise, sonic inlet, jet noise suppressors, noise absorbing aircraft, low-noise fans, low-emission combusters, etc.

3. R&D subjects for FY 1980 are divided into three.

(1) Airframe structure: Helicopter blades made of composite materials, fiber-reinforced metal materials,

processing of composite materials, machining of light integral structures, grinding of wide and long fuselage, development of strengthened aluminum alloys, and composite material-made rigid wing structures.

(2) Powerplant: High-temperature and high-load turbines, engine combusters producing less nitrogen oxide, high-speed propellers with variable pitch structures, and hydrogen fuel burning engines.

(3) Control systems: New automatic control systems, optical fiber data processing systems, new navigational systems, and new cockpit display devices.

CSO: 4120

ECONOMIC

VACUUM FURNACE ORDER INCREASING AIRCRAFT INDUSTRY SALES

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 5-6

[Text]

ULVAC (ultra vacuum) Corp., Japan's top vacuum equipment manufacturer, has received orders from Mitsubishi Heavy Industries (MHI) and Metal Technique Co. (MTC) for large vacuum heat treatment furnaces for treating aircraft materials, launching participation by Japan's aircraft industry.

The furnaces are designed to treat heat resistant alloys for jet and rocket engine parts to be used at high temperatures and under high pressures.

The ¥300 million furnace for MHI's Nagoya Aircraft Works is one of the world's biggest. It has a two-meter-diameter, two-meter-high heating room with a maximum treatment capacity of 1,500 kilograms, two times greater than so-far manufactured equipment. The vertical, two-room and gas-cooling vacuum furnace consists of a cooling room, a heating room, a cylinder for positioning materials, pumps and other components. Its height is about 17 meters and its floor space cover about 200 square meters. In the furnace, pressure can be reduced to one-100 millionth of one atmosphere and temperature can be boosted to 1,300 degrees centigrade.

The vacuum furnace for MTC's Gumma heat treatment works has a 1.2-meter-long, 1.8-meter-wide and 0.8-meter-high heating room and can handle 1,000 kilograms. Its maximum temperature and minimum pressure are the same as the MHI furnace.

Vacuum heat treatment can boost metallic materials' heat resistance and durability. It can be applied to special metals such as titanium, aluminum and cobalt. It is also used in a wide range of heat treatment processes, including quenching, tempering, brazing and sintering, according to material.

Japan's vacuum heat treatment demand is estimated at ¥10,000 million a year. The big market is shared by Ishikawajima-Harima Heavy Industries (IHI), Hayes Japan and ULVAC.

Although automakers and electric appliance producers account for the greater part of the demand at present, demand from aircraft manufacturers is expected to increase due to stepped-up aircraft production, including Boeing 767s, F-15 fighters and MHI's MU-300 business jets.

MTC, engaged in heat treatment of metals, has obtained quality standards for heat treatment of aircraft parts from Boeing and Rolls-Royce.

CSO: 4120

MATSUURA MACHINERY DEVELOPS NEW MC FOR AIRCRAFT MANUFACTURE

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 p 6

[Text]

Matsuura Machinery Corp., a machine tool manufacturer based in Fukui, north central Japan, has developed an improved machining center, named the MC-1000V, for aircraft manufacture based on two MCs delivered to Rolls-Royce last July for machining main jet engine parts.

It will produce 10 units per month while promoting sales to aircraft manufacturers.

The two vertical MCs delivered to Rolls-Royce will be used to machine main parts of the fuel-efficient RB211 engines for new generation wide-body aircraft, which will become operational next spring. Although Rolls-Royce rarely introduces Japanese MCs, Matsuura Machinery said the British engine manufacturer apparently values the accuracy and reliability of another Matsuura MC delivered in 1978.

The order from Rolls-Royce has prompted Matsuura Machinery to step up production of MCs for aircraft manufacture.

The new MC-1000V features easy maintenance, accuracy and stability. Specifications follow:

Table machining area: 500mm X 1,500mm

XYZ-direction movements: 1,050mm X 510mm X 560mm

Number of tools: 30

Spindle speed: 3,580 cycles per minute

Spindle motor: DC11 kilowatts

Weight: 6,800 kilograms (except control systems)

CSO: 4120

BRIEFS

NEXT AIR SHOW--The Society of Japanese Aerospace Companies (SJAC) decided at its board meeting last week that the next Japan International Aerospace Show will be held at Iruma Air Base near Tokyo in October 1983, pending final approval by the Defense Agency. The board has also decided to participate in the 1981 Paris Air Show. A group exhibition and a joint SJAC chalet as were the case with the '79 show are being suggested. Details will be studied at working-level meetings. As for possible participation in the Singapore air show slated for September 1981, SJAC will encourage individual participation but is not considering group participation, sources say. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 p 2]

CSO: 4120

MSDF ORDERS FIVE FY 1980 FUNDED WARSHIPS

Tokyo JPE AVIATION REPORT-WEEKLY in English 24 Sep 80 p 6

[Text]

The Maritime Self-Defense Force (MSDF) awarded contracts in the middle of September for construction of five new warships under the FY 1980 defense budget, including two 2,900-ton DDs, one 1,400-ton DE, one 2,200-ton submarine, and two mine-sweepers.

The 2,900-ton DD type destroyer will be armed with up-to-date missile systems and other advanced equipment. It will be powered by the Rolls-Royce/KHI TM3B Olympus and the RM1C Tyne gasturbine engines, which KHI will produce under license. The 1,400-ton DE escort frigate will be powered by the Olympus gasturbine engine for highspeed operations and the MHI-designed 6DRV diesel engine for cruising. The first Harpoon SSM-armed submarine will be built by MHI, powered by KHI's V8V diesel engine. Japan Steel and Hitachi will each construct one mine-sweeper, both of which will be powered by MHI's 12ZC diesel engine.

CSO: 4120

MILITARY

BRITISH NAVAL ENGINE EQUIPMENT FOR MSDF

Tokyo JPE AVIATION REPORT-WEEKLY in English 24 Sep 80 pp 6-7

[Text]

SSS Gears Ltd. of London will appoint Chuetsu Waukesha Co., Ltd. of Tokyo its representative in Japan for the sales and services of its synchro self-shifting (SSS) clutches to the Maritime Self-Defense Force (MSDF). A formal contract will be signed very soon, the Japanese company revealed last week.

SSS clutches are in use with leading navies of the Western world as power transmitting components of Rolls-Royce marine gas turbine engines. The same SSS clutches will be adopted for the Marine Olympus and the Tyne engines now being produced for new MSDF warships by Kawasaki Heavy Industries Ltd. under license from Rolls-Royce Limited. Chuetsu estimates the sales of the SSS clutches to the MSDF in the initial year will amount to approximately ¥200 million.

Chuetsu is negotiating with SSS Gears to expand its sales territories to Southeast Asia in addition to Japan. It also wants to sell the clutches for industrial gas turbines.

CSO: 4120

MILITARY

GSDF TO INTRODUCE 203MM HSP IN FY 1981

Tokyo JPE AVIATION REPORT-WEEKLY in English 24 Sep 80 p 7

[Text]

Beginning in FY 1981, the Ground Self-Defense Force (GSDF) plans to start a procurement program for the US Army M110A2 self-propelled 203mm howitzer for service introduction, replacing 155mm and 203mm howitzers. A contract valued at ¥2,073 million will be concluded in FY 1981 for the first seven howitzers for the GSDF training unit. ....

The GSDF plans to obtain the M110A2 HSP through license production from the outset and four Japanese manufacturers ---Japan Steel, MHI, Komatsu, and Hitachi---have completed preparatory studies in the US for local production. Latest indications are that the gun barrel will not be approved by the US Army for local manufacture. The engine is easily available in the American market and should not require licensing, industry sources say.

Under the circumstances, it is likely that the barrel and the engine for the first seven M110A2 howitzers will be imported, the former through a foreign military sales (FMS) contract.

For local production, Japan Steel will be designated the barrel-linked equipment manufacturer while the chassis will be ordered from MHI, Komatsu, and Hitachi.

CSO: 4120

FY 1981 E-2C PROGRAM TO TOTAL ¥63 BILLION

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 p 7

[Text]

In addition to procurement of four Grumman E-2C early warning aircraft totaling ¥49,825 million, the ASDF has requested ¥13,800 million for procurement of related equipment through the FMS channel in the FY 1981 defense budget draft. The equipment is shceduled to be delivered in FY '83. The aircraft and related equipment requested in the budget draft for the next fiscal year will total almost ¥63 billion.

Approximately ¥2,087 million was founded in FY '79 for procurement of initial training equipment and training of programmers and maintenance personnel in the US. The equipment will be used for training Japanese air force personnel in the US during the period, FY '80 through FY '82 and then will be shipped to Japan for installation at ASDF facilities. Another ¥11,640 million is included in the current fiscal year budget for similar purposes.

In addition, the ASDF plans to place a ¥300 million order with Japanese suppliers for maintenance and stocked items of local manufacture in FY '82 for supporting the four aircraft to be funded in FY '81.

Including four E-2Cs already ordered, the ASDF will have eight Grumman aircraft in its operational inventory by FY '85.

CSO: 4120

MILITARY

C-130H TRANSPORT PROCUREMENT, DEPLOYMENT PLANS

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 pp 6,7

[Text] The ASDF has requested approximately ¥41,400 million in the FY 1981 defense budget draft for procurement of six Lockheed C-130H transports including parts and supporting equipment. Detailed figures related to the procurement plan follow:

Flyway costs of six aircraft -- ¥29,100 million (¥4,850 million per aircraft), initial spare parts -- ¥5,500 million, spare engines and propellers -- ¥700 million, ground support equipment -- ¥2,000 million, cargo handling equipment -- ¥100 million, training support equipment -- ¥2,600 million, and other miscellaneous expenses -- ¥1,400 million. (All figures are approximate.)

The ASDF plans to issue a contract in FY 1981 for the six aircraft through the government-to-government foreign military sales (FMS) channel pending approval of the budget request by the Diet (parliament). The first two aircraft will be delivered in FY '83 and the remaining four in FY '84, according to present ASDF planning.

A second contract for an additional six aircraft is being planned for FY 1983.

In peace time operations, the aircraft will be used for various ASDF air transport missions as well as supporting the Ground Self-Defense Force (GSDF) in airborne missions. Deployment of the C-130 is expected to considerably increase efficiency in airborne operations. The conventional C-1 can carry only light firearms such as the 106mm mobile recoilless rifle and the 105mm towed howitzer, while the C-130 will be able to transport heavy equipment such as the 203mm howitzer.

Iruma base near Tokyo is presently considered the likely home for the first Japanese Hercules transport squadron.

CSO: 4120

FIXED WING ASW AIRCRAFT TO BE STANDARDIZED WITH P-3C

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 p 8

[Text]

In accordance with the decision by the Maritime Self-Defense Force (MSDF) and the Japanese Defense Agency (JDA) to terminate further procurement of the Shin Meiwa PS-1 antisubmarine flyingboat, the MSDF is reportedly studying possibilities to eventually standardize all land-based antisub fixed-wing aircraft with the Lockheed P-3C and its derivatives, sources say.

At present, the MSDF has 10 land-based fixed-wing aircraft squadrons using P-2Js and the S2F-1s, one PS-1 flyingboat squadron and five HSS-2A/B helicopter squadrons in its antisubmarine air force.

The present P-3C program which started in FY '77 will end in FY '87 with delivery of 45 aircraft to the MSDF. It plans to procure an additional 35 to 45 P-3Cs or improved versions of the Lockheed design to replace P2V-7/P-2Js and S-2F-1s over four to five years, starting in FY '88.

The P-3C (or its derivative) may also be considered as the likely replacement for the Shin Meiwa PS-1 which will begin to be phased out around that time. If so, the MSDF will eventually have 100 or more P-3Cs, comprising 11 squadrons, sources say.

Some have suggested procurement of the S-3A class fixed-wing aircraft to replace the S-2F-1 but a majority is in favor of increasing the P-3C on grounds that the S-3A is basically designed for carrier operations, and that it would be better for the MSDF to standerdize equipment from maintenance and operational considerations, they say.

CSO: 4120

ASDF TO USE C-1 TRANSPORT FOR ECM TRAINING

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 7-8

[Text]

The Air Self-Defense Force (ASDF) plans to use a C-1 transport for electronic countermeasure (ECM) training. It has incorporated funds for modifying a C-1 into the budget request for FY 1981 starting in April 1981.

This C-1 will be equipped with the XJ/ALQ-5 ECM system for ECM training against ground control radar systems and surface-to-air missile guidance.

The XJ/ALQ-5 ECM system, now being developed by Mitsubishi Electric Corp., will be delivered to Kawasaki Heavy Industries (KHI) by the third quarter of FY 1982.

KHI will perform the modification. It is to conclude a ¥190 million contract with the Technical R&D Institute of the Defense Agency by the end of this year for basic design of a modified C-1.

The firm will deal with detailed design in FY 1981 after basic design in late FY 1980. From the latter half of FY 1981, it will manufacture required metallurgical tools and modified C-1 parts. Modification will be carried out in the third and fourth quarters of FY 1982. After flight tests, a modified C-1 will be delivered to ASDF in the second quarter of FY 1983. ASDF will conduct technical tests in FY 1984 and put it into operation in FY 1985.

As of October 1981, ASDF will have 31 C-1s, of which two will be modified for a flying test bed and the ECM aircraft.

Of the 29 transport-type C-1s, ASDF will use 24 for actual operation and five for reserve.

CSO: 4120

GSDF PLANNING TO IMPORT GUIDED PROJECTILES IN FY '81

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 p 8

[Text]

In line with a Ground Self-Defense Force plan to evaluate guided projectiles for the 155mm gun, the Defense Agency has included necessary funds in the FY 1981 defense budget request draft submitted to the Ministry of Finance, sources say.

The GSDF wants to import, for evaluation purposes, 155mm cannon launched guided projectiles developed by the US Army and Martin Marietta Aerospace Corp. The US Army has basically agreed to the release of this projectile to Japan, local sources say.

According to present GSDF planning, samples of the projectile will be imported with funds authorized in the FY 1981 defense budget and tests will continue until FY 1984. It plans to place the new ammunition in service in or after FY '85.

The new firearm the GSDF has in mind consists of a laser firing system and the guided projectile which will be fired by either the conventional 155mm howitzer or a future 155mm self-propelled howitzer, one report says.

The Technical R&D Institute, JDA, started basic studies on the guided projectile for the 155mm howitzer but stopped because of precision guidance and operational problems, it added.

CSO: 4120

BRIEFS

F-15 FLIGHT TESTS--The Air Self-Defense Force (ASDF) F-15 technical evaluation group headed by Col Yuzo Otsubo began flight testing in early October one of the first two aircraft Japan received from McDonnell Douglas in July. The aircraft remained at St Louis, Mo. for continued company testing after delivery. Aircraft No 1 will be flown to Whiteman Air Force Base in early October for flight testing. The first test is scheduled to be data-linking with equipment installed at St Louis. The flight tests will continue until the middle of the month. Aircraft No 2 will continue to remain in St Louis for the time being and performance and weapons delivery tests using this aircraft are scheduled to begin at Edwards AFB in the latter part of October. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 7,8]

STEADY TEAM TO U.S.--The ASDF plans to send officials to the U.S. in early FY 1981 to study the Air Combat Maneuvering Range-Instrumentation (ACMR-I) systems being used by the U.S. Air Force, Navy and Marine Corps for training pilots in air combat, sources report. This is one of the training improvement program the ASDF will promote next fiscal year. The others include a general exercise of the entire ASDF units, an annual firing exercise of ASDF Nike missile units in the U.S. and upgrading of training control functions over the airspace of the Northern and Western commands, they say. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 pp 7,8]

CSO: 4120

SCIENCE, TECHNOLOGY AGENCY ANNOUNCES JFY 1981 BUDGET

Tokyo KAGAKU SHIMBUN in Japanese 5 Sep 80 p 1

[Text] New Item, "Creative Science and Technology"

The Science and Technology Agency [STA] compiled and announced the estimated budget requests for the next fiscal year (JFY 1981). The budget requests amount to 321.061 billion yen for general account and 62.284 billion yen for special account to promote development of electric power sources, for a total of 383.345 billion yen for the STA. As compared with the 337.755 billion yen for the previous year (JFY 1980), this is an increase of 13.5 percent. Noteworthy items in next year's budget are R&D of earth resources technology satellite No 1 in the space development program (1.153 billion yen), development of H-I rockets (3.006 billion yen), construction of gene-recombination research facility (P4 level) in the field of life sciences (236 million yen), etc. Also, a new item called "promotion of creative S&T" has been established and the first year's request is 1.07 billion yen. A breakdown of the estimated budget requests (general account) is given below (figures given in units of 1 million yen; figures in parentheses are for JFY 1980 budget).

Includes Facility for Gene-Recombination

Promotion of R&D and Uses of Atomic Energy: Total of 184,942 (167,354), including (1) administration of atomic energy safety regulations and environmental safety measures, 2,518 (2,112)--Atomic Energy Safety Committee, 319; preventive measures against radiation hazards, 112; measures to dispose of radioactive wastes, 292; research on radiation measurements, 1,113; security measures, and protective measures against nuclear materials, 559; (2) Power Reactor and Nuclear Fuel Development Corporation, 81,807 (81,465)--development of power reactor, 45,611 (of which, 21,532 for development of fast breeder reactor and 2,149 for development of new-type converter); overseas survey and drilling for uranium ores, 6,012; development of uranium enrichment technology, 18,571; (3) Japan Atomic Energy Research Institute, 84,046 (69,544)--research on safety features, 8,839; R&D of nuclear fusion, 39,178 (of which, 30,585 for construction of JT-60 and 4,481 for Japan-U.S. nuclear fusion cooperation); research on multi-purpose high-temperature gas reactor, 5,410; (4) Japan Nuclear Ship Development Agency, 7,196 (6,451)--repair, overhaul and construction of new homeport of nuclear ship "Mutsu", 4,020; (5) National Institute of Radiological Sciences, 5,498 (4,475)--construction of laboratory wing for nucleer exposure tests, 1,762; research on influences of low-level radiation, 360; (6) experiments and research of national experimental and research organs, 1,912 (1,634); (7) atomic research at the Institute of Physical and Chemical Research, 1,094 (911); (8) Others, 871 (762)--Japan Atomic Energy Commission, 164; contracts for research on peaceful uses of atomic energy, 180.

Promotion of Space Development: Total of 88,253 (85,097), including (1) National Space Development Agency, 86,883 (83,727)--development of communications satellite No 2, 5,281; development of broadcast satellite No 2, 3,191; development of geostationary meteorological satellite No 2, 10,778; development of ocean observation satellite No 1, 7,088; R&D of earth resources technology satellite No 1, 1,153; development of H-I rockets, 3,006; trial manufacture and tests to evaluate reliability of upper-stage rockets, 606; reception and disposition of earth observation information, 1,607; (2) space R&D by National Aerospace Laboratory, 821 (833); (3) Others, 549 (537)--Space Activities Commission, 45; financial aid to enterprises assisting fishery of Tanegashima and vicinity, 426.

Promotion of Ocean Development: Total of 7,668 (4,749), including (1) Center for Marine Science and Technology, 7,414 (4,531)--completion and operation of underwater survey ship, 4,596; R&D of underwater operations technology, 396; basic designing of ocean operations experimental ship, 45; R&D of wave activated power generation system, 48; R&D of ocean area control technology and new marine observation system, 146; R&D of technology of deep sea probes through telemetering, 32; (2) other ocean development projects, 254 (218)--survey and research of developing and using the Kuroshio current, 126; [R&D of technology of deep sea probes through telemetering, 110].

1.5 Billion Yen for Earthquake Forecasting

Promotion of Disaster Prevention Science and Technology: Total of 2,712 (2,329), including (1) National Research Center for Disaster Prevention, 2,642 (2,296)--earthquake forecasting, 1,550; measures to cope with earthquake disasters, 173; measures to cope with snow damages, 68; (2) others, 70 (33)--research on earthquake forecasting at Center of Marine Science and Technology, 40 (same).

Promotion of Creative Science and Technology: 1,070 (new).

Promotion of Important Consolidated Research, Etc.: Total of 26,986 (22,297), including (1) promotion of life sciences, 1,096 (945)--promotion of life sciences at Institute of Physical and Chemical Research, 1088 (of which, 236 for construction of gene-recombination research facility); (2) research on aeronautical technology at National Aerospace Laboratory, 8,006 (5,215)--R&D of fan-jet STOL experimental aircraft, 4,491; (3) research on subjects, other than atomic energy and life sciences, at

Institute of Physical and Chemical Research, 6,772 (6,587)--R&D of lasers, 356; (4) promotion of R&D of material technology, 5,581 (4,927)--material research at National Research Institute for Metals, 3,718; material research at National Institute of Research in Inorganic Materials, 1,863; (5) promotion of specified consolidated research, 1,750 (1,550)--special survey expenses, 1,350; appropriations to operational organs such as Institute of Physical and Chemical Research, 400 (same); (6) promotion of measures for coordinated uses of natural resources, 435 (326)--contract for corroborative tests of regional energy sources, 102; contract for testing effective uses of gas from waste disposal, 11; natural resources survey stations, 258; contract for drafting food ingredients charts, 32; (7) promotion of commercializing new technologies and transferring technologies, 3,346 (2,747)--new technology groups, 3,331 (including same amount, 50, for atomic energy).

Consolidating Basis for Promoting Science and Technology: Total of 5,131 (4,611), including (1) strengthening foundation for R&D, such as formulating basic plans for S&T, 458 (414)--formulation of basic S&T plans, 66; domestic and overseas training of government researchers, 392 (including same amount, 103, for atomic energy and space); (2) promotion of research interchange activities at Tsukuba university town, 63 (56); (3) promotion of dissemination of S&T information, 4,345 (3,903)--Japan Information Center of Science and Technology, 4,319 (of which, 1091 for on-line information retrieval service and 2,628 to expand data base); (4) promotion of S&T informational and educational activities, 265 (238)--general public information and education, 126 (of which, 27 for assisting science club activities); atomic energy development, utilization, diffusion and education, 131 (same); space development, diffusion and education, 8 (same).

Sponsorship of International Science and Technology Exhibition: 807 (115)--promotion of enterprises related to government exhibitions, 343; assistance to International Science and Technology Exhibition Association, 435.

Promotion of International Cooperation: Total of 5,418 (4,230), including (1) promotion of cooperation with advanced countries, 303 (253)--participation in OECD-NEA joint enterprises, 144 (same); Japan-PRC S&T cooperation, 7; (2) promotion of Japan-U.S. S&T cooperation, 5,002 (3,880)--energy field, 4,922 (of which, 4,496 for nuclear fusion, appropriated again from nuclear energy; 421 for photosynthesis, appropriated again from Institute of Physical and Chemical Research), etc.

9134
CSO: 8129/0031B

RESEARCH, DEVELOPMENT PROJECTS ON ELECTRONIC EQUIPMENT IN FY 1981

Tokyo JPE AVIATION REPORT-WEEKLY in English 24 Sep 80 pp 7-8

[Text]

The Technical R&D Institute (TR&DI) of the Defense Agency has requested ¥7,700 million in the FY 1981 defense draft budget for R&D projects on electronic equipment.

Technical development projects include second phase work for the electronic communications exchange system for the GSDF's five regional commands (¥490 million); new radio equipment for field use by the GSDF (¥540 million); a new mortar-locating radar system for the GSDF (¥900 million); a new battlefield surveillance radar system (¥270 million); an electronic jamming system for MSDF surface vessels (¥1,360 million); an inertial navigation system for MSDF submarines (¥330 million); and three airborne ECM systems for the Air Self-Defense Force (ASDF)---XJ/ALR-1 (¥420 million), XJ/ALQ-5 (¥1,240 million), and XJ/ALQ-8 (¥470 million).

Experimental fabrication will be made for a liquid fuel laser device (¥80 million); an infrared sensor (¥200 million); ultra low frequency signal processing systems (¥190 million); and an antenna for future fire control systems (¥170 million).

In addition basic designing for installation of the XJ/ALQ-8 ECM system will be contracted to a commercial firm.

CSO: 4120

HITACHI TO BUILD EXPERIMENTAL FRP BOAT

Tokyo JPE AVIATION REPORT-WEEKLY in English 24 Sep 80 p 8

[Text]

Hitachi Shipbuilding & Engineering Co. was recently awarded an ¥508.3 million contract by the Defense Agency to build an experimental forced resin plastic hull. The 25m long hull for a 200-ton FRP boat will be delivered by the end of March 1981. A further ¥370 million is on request in the FY 1981 defense budget draft for installation of mine-sweeping equipment and systems for operational tests by the MSDF.

Construction of new mine-sweepers built with FRP material has been contemplated by the MSDF first to cope with cost increases in wood. But, it is mainly intended to meet advances in mine-sweeping equipment and systems for varied missions, including deep-sea clearing.

Based on tests with the experimental FRP craft, which will be completed in FY 1982-83, the MSDF will finalize a plan for new FRP mine-sweeper construction program for FY 1984 and beyond.

The new FRP mine-sweepers are expected to be larger than the wooden 440-ton boats currently in service.

CSO: 4120

NEC SUCCEEDS IN PICTURING SEASAT SAR DATA

Tokyo JPE AVIATION REPORT-WEEKLY in English 1 Oct 80 p 9

[Text]

Nippon Electric Co. (NEC) has succeded in picturing radar reflection signals from the synthetic aperture radar (SAR) of the SEASAT, an ocean survey satellite of the United States, through a large computer's digital process for the first time in Japan.

The successful effort utilized basic SAR technology developed by the company, paving the way for domestic production of a SAR system to be mounted on Japan's earth resources satellites, NEC said.

The SAR is a remote sensing radar. It can observe the surface through clouds or at night as microwaves with longer wavelengths are used. This performance could not be achieved by optical sensors mounted on the LANDSAT and other earth observation satellites.

The SAR, mounted on SEASAT for the first time, collected data from the earth from June to October 1978. The data pictured by NEC are from the Alps, Lake Leman and Geneva. They were received by a British ground station from the SEASAT.

NEC is the world's first private company to develop SAR data picturing software on its own in only three months. The success is attributed to NEC's technology covering digital signal processing, satellites, radar and data transmission, all of which are necessary for picturing the data. The successful software development has removed a technical barrier against Japan's domestic SAR production, NEC says.

CSO: 4120

JDA/MITI PREPARING FOR START OF MT-X DEVELOPMENT

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 8-9

[Text]

The JDA will push for the start of the MT-X new medium jet trainer development program in FY 1981 through final negotiations with the Ministry of Finance (MOF), which will continue until the end of December when the national budget request for the next fiscal year will be approved by the Cabinet.

Request totaling ¥2,398 million including ¥1,903 million as follow-on disbursement over two years are included in the FY 1981 defense budget draft submitted to the MOF at the end of August. The MT-X will be designed to initially replace the aging Lockheed T-33 and the Fuji T-1 trainer aircraft. It will later be used to take over some of the missions now being performed by the Mitsubishi T-2 supersonic trainer, according to ASDF sources.

In parallel with the moves of JDA, the Ministry of International Trade and Industry (MITI) will begin preparatory work concerning development and production of the MT-X program including selection of a prime contractor. Mitsubishi, Kawasaki and Fuji heavy industrial firms have respectively expressed desires to take the lead in development and subsequent production of the aircraft.

The MT-X will be subject to Japan's Aircraft Production Law and MITI will be administratively responsible for selection of the prime contractor. After the FY 1981 budget request is approved by the Cabinet, it will hear proposals from the three companies as well as such other manufacturers as Shin Meiwa and NIPPI (Japan Aircraft Manufacturing Co.) and also seek advice from the ASDF and the JDA. A higher-level political decision may be required in selection of the MT-X prime contractor since all the three heavy industry companies have capabilities in taking leadership in development and production of the aircraft, industry sources say.

According to present ASDF planning, the MT-X will have a maximum speed of 900 kilometer at sea level, a maximum ceiling of more than 12,000 meters and a range of over 1,260 kilometer. The rate of climb at sea level will be approximately 3,000 m/min. Take-off runs will require about 800 m and landings about 750 m.

CSO: 4120

SCIENCE AND TECHNOLOGY

TR&DI TO FABRICATE PRECISION GUIDED SIMULATOR IN FY'81

Tokyo JPE AVIATION REPORT-WEEKLY in English 8 Oct 80 pp 9-10

[Text]

The Technical R&D Institute (TR&DI) will fabricate a new precision guided simulator in FY 1981 to assist in developing eight new guided weapons expected in FY 1982 and after.

The TR&DI has so far developed the Model 64 MAT, Ju-MAT, ASM-1, short-range SAM guided missiles which are being covered by the existing missile simulator at its Third R&D Center for radar homing missiles. However, new guided weapons are planned to have not only radar homing systems but also IR-CCD image homing and other advanced guidance systems. The new simulator is designed to evaluate and support these new guided weapons.

The institute is believed to have earmarked about ¥900 million for fabrication of the new simulator in the Defense Agency's budget request for FY 1981. The fabrication started in the current fiscal year, though funds have been cut by about 50 percent from the requested level. The request for FY 1981 will not be rejected, according to informed sources.

The eight new guided weapons subject to research and development are included in the FY 1981 budget request. Indications are that these weapons would become items for technical development in FY 1982 and after.

CSO: 4120 END

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MILITARY

SCENE SET FOR CHANGING VIEWS ON DEFENSE SPENDING

Tokyo BUSINESS JAPAN in English Oct 80 p 129

/Text/

PRIME Minister Zenko Suzuki is, despite his relatively short time in office, rather shrewdly testing the waters in what could well prove to be one of the major issues of his tenure as head of government: at what pace and to what extent should Japan boost its military strength? The question, to a large degree forced on Japan by Washington, could have an important impact on Japan's domestic economy.

In the wake of the Soviet invasion of Afghanistan in December 1979, the Americans have strengthened demands that Japan should shoulder more of the burden for its own defense. But a growing number of thoughtful Japanese are also convinced of the need for a review of the nation's military options. The continued viability of postwar pacificism is being questioned with increasing frankness in the light of the recent upheaveals in areas of vital importance to Japanese economic interests such as the Middle East, South Korea and Indochina.

To be sure, the suggestion that Japan should build its Self-Defense Forces (SDF) into a command capable of holding off a non-nuclear strike against the home islands or keeping vital sea-lanes clear still raises strong reactions in some quarters in Japan, especially among left-leaning opposition parties.

But the new willingness to debate the issue openly signals a growing level of public acceptance of this once taboo subject. Japan's conservative leaders seem determined, if for the most part cautiously so, to mold this new tolerance into a popular consensus favoring more assertive defense policies.

There has been further evidence that the defense debate has moved decisively off center. Defense Agency director Joji Omura and Finance Minister Michio Watanabe agreed recently to increase defense spending in fiscal 1981 (beginning April 1981) by 9.7% over this fiscal year's budget, to an amount equivalent to 0.91% of Japan's gross national product (GNP) for the period (the figure should hit 0.9% during the current fiscal period).

By American and European standards, the amount is still modest. It is also well below the 1% of the GNP, the pychological ceiling which the Japanese have imposed on themselves as the upper limit of "safe" defense spending (though, according to NATO's formula for culculation, that Japanese already spend considerably more). The proposed appropriation looks even smaller when discounted for inflation (currently running at an annual rate of about 8%). For the Japanese, however, the spending rise has considerable meaning.

Clearly, the Omura-Watanabe compromise was, under the circumstances, a deft stroke of political gamesmanship. The defense chief wanted a 15% rise in expenditures to help assuage American critics and meet Washington's demands that Tokyo push forward the completion of its current five-year defense build-up program by one year to 1983. (Defense experts in Tokyo estimate that it would actually take an average increase of 15.4% between now and 1983 to comply).

Watanabe, charged with cutting government spending to help lower the Treasury's bulging deficits, was forced to draw the line short of Omura's request, but not so short that Tokyo might appear to be backing out on pledges made by the late Prime Minister Masayoshi Ohira during his summit talks in May with U.S. President Jimmy Carter. Ohira assured Carter that Japan would shoulder gradual but significant increases in defense.

To show that even the traditionally tight-fisted Treasury is taking the matter seriously, Watanabe agreed to exclude defense from the 7.9% guideline on budgetary increases to which he plans to hold practically all other government departments. At 9.7% (compared to this fiscal year's increase of 6.5%), the rise in defense appropriations is likely to be augmented by a separately budgeted amount for civil servants' pay increases (which includes military personnel), pushing the actual figure into the double-digit range.

Under the inter-ministerial trade-off, the cabinet officers also agreed to consider further rises in defense-related appropriations should such moves be warranted by changes in the international scene between now and the time the budget draft is completed at the end of the year.

For Japanese domestic consumption, the value of the deal (no doubt encouraged, if not directly inspired, by Suzuki) is that the ruling party can make itself appear to be making the best of an uncomfortable dilemma: squeezed on the one side by demands to ease the nation's red-ink finances and, on the other, by U.S. badgering to strengthen defenses.

Aside from budgetary constraints, however, public opinion in Japan remains the chief stumbling-block in the way of more decisive action. The public is, for the most part. undecided on the issue – and probably tends to be slightly negative after more than three decades of domestic politics tinged with strong anti-war sentiment. But, the fact that today's Japanese (many of whom have no direct experience of war) hold no very definite opinions on the matter, as opposed to the strong positions of even the recent past, has in itself opened the way for change. ◘

CSO: 4120

MILITARY

SECOND DEFENSE TECHNOLOGY, EQUIPMENT CONFERENCE SET

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 p 4

[Text]

The Japanese Defense Agency (JDA) and the US Defense Department will hold their second defense technology and equipment conference in Tokyo Dec. 2-3.

The conference was established to cover bilateral cooperation in defense technology and equipment, when William J. Perry, US Undersecretary of Defense for Research and Engineering, held talks with Akira Watari, Vice Minister for Defense, JDA, in Tokyo in May.

The first meeting took place in Washington Sept. 3-4 between Vitalij Garber, Deputy Undersecretary for International Programs at Perry's office, and Yutaka Wada, Director-General of the JDA's Equipment Bureau.

At the Washington meeting, the Japanese side asked for permission to use US facilities for testing new weapons systems and aircraft. The American side is believed to have consented.

This has paved the way for Japan's use of US facilities for testing a new intermediate trainer to be developed. The sophisticated trainer, coded MT-X, will undergo tests which Japanese facilities cannot cover.

At the coming meeting or the third, the Japanese will submit a specific request to use American facilities for high-altitude performance tests for an MT-X engine now under development. Tests for an MT-X airframe will be discussed in parallel to progress in the MT-X engine project.

The Japanese at the first meeting also requested an increased local production ratio for F-15 fighter engines and local production of Sidewinder AIM-9L air-to-air missiles, and briefed the Americans on the ASM-1 air-to-surface missile which JDA developed.

CSO: 4120

JDA TO ADOPT FOUR NEW WEAPONS SYSTEMS

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 4-5

[Text]

The Japanese Defense Agency (JDA) at a meeting of the equipment evaluation committee's coordination subcommittee in late September, decided to adopt four new locally developed weapons systems--the short-range surface-to-air missile (SAM), the ASM-1 air-to-surface missile, a new pontoon for river-crossing operations, and an electronic countermeasure (ECM) system for antisubmarine patrol aircraft.

The short-range SAM has been developed by the Ground Self-Defense Force (GSDF) and the Technical R&D Institute (TR&DI) in cooperation with Toshiba Corp. The missile is designed to cover an operational gap between the Hawk missile system and the L-90 35mm antiair machine guns in antiaircraft defense. Demonstration tests were held in FY 1978 and 1979 with high-speed target drones. The GSDF has requested ¥17,168 million for FY 1981 to purchase 24 short-range SAMs for its AAA school, while the ASDF has asked for ¥8,584.3 million to procure 12 units for base defense.

The ASM-1 is a short-range guided missile for airborne attacks on ships. It has been developed by an ASM engineering team, led by Mitsubishi Heavy Industries. Some units for operational evaluation were procured in FY 1978 and 1979. About ¥3,500 million is incorporated into the FY 1980 budget to procure 25 units for practical deployment. They are being mounted on F-1 support fighters.

The new pontoon will replace GSDF's existing steel pontoon systems to step up mobility of Model 74 tanks. It was experimentally fabricated from FY 1974 to 1977 at cost of about ¥500 million. Demonstration tests finished in FY 1979. New pontoons for initial procurement in FY 1981 will be used for training. In future, they will be issued to GSDF construction battalions.

The ECM system for P-2J antisubmarine patrol aircraft was developed by Mitsubishi Electric Corp. from FY 1977 through 1978 at cost of approximately ¥420 million. Functional tests were conducted in FY 1979. Procurement is expected to start in FY 1981.

CSO: 4120

SAM MISSILE PROCUREMENT IN FY'81 FOR AIR BASE DEFENSE

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 5-6

[Text]

The ASDF has requested about ¥9,000 million for FY 1981 starting next April to procure short-range and portable Stinger surface-to-air missiles (SAM) in effort to build up its air base defense capability. The short-range SAM was locally developed.

This is to follow purchase of four advanced 20mm antiair machine guns from the United States under the foreign military sales arrangement in FY 1979. These guns are designed for defense of radar sites.

To upgrade air defense capability of ASDF bases and radar sites, the ASDF plans to take such measures as deployment of antiair weapons systems, promotion of base guard systems, construction of aircraft shelters and development of materials for rapid runway refurbishing, all of which will consume time and money.

The procurement of SAMs and 20mm machine guns represents a specific action for promotion of base defense.

The ASDF is likely not to take any specific action regarding 20mm gun deployment in FY 1981 because evaluation tests and other processes are necessary.

It had requested procurement of 20mm machine guns for FY 1980. But this request was dropped because it has not evaluated the advanced antiair guns.

Besides the advanced antiair guns, the ASDF is considering using 20mm Vulcan guns of F-104J fighters for base defense simultaneously with the fighters' phase-out. It has already studied performance requirements and cost efficiency of modifing the Vulcans for ground use. However, practical tests would be necessary before deciding whether to use the 20mm guns for base defense.

CSO: 4120

MILITARY

MODEL 74 TANKS FOR NEW SELF-PROPELLED ANTIAIR GUNS

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 6-7

[Text]

The Ground Self-Defense Force (GSDF) is expected to use Model 74 tank chassis for the new AW-X self-propelled antiair guns now under development, although the current AW-X scheme envisages a 35mm antiair gun system mounted on the chassis of Model 61 tanks.

After the first phase of the AW-X project is finished in the current fiscal year ending next March, an antiair gun system put on the Model 74 tank chassis will become subject to development in FY 1982 for completion in FY 1986. The GSDF is expected to procure about 120 of the new guns. A specific procurement plan will be incorporated into the next medium-term defense program.

The GSDF is giving priority to modernization of antiair weapons systems. The AW-X project forms part of a modernization project with procurement of short-range and portable surface-to-air missiles starting in FY 1981.

In the first phase, the Technical R&D Institute is to fabricate the turret and the vehicle body in the current fiscal year. Japan Steel Works will fabricate the turret, while Mitsubishi Heavy Industries will manufacture the vehicle chassis from a Model 61 tank.

The Model 61 tank chassis had been picked for the AW-X because of the tank's planned phase-out. However, an AW-X using the Model 61 tank chassis may be unable to operate jointly with Model 74 or new tanks.

Since mobility is an important requirement for the AW-X designed for joint operation with tanks, the GSDF has leaned toward utilizing the Model 74 tank chassis.

CSO: 4120

MILITARY

GSDF TO SELECT NEW HOWITZER BY YEAR END

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 p 7

[Text]

The Ground Self-Defense Force (GSDF) is believed likely to select a new 155mm howitzer for purchase in FY 1982 by the end of 1980. Candidates include the M-198 of the United States, the FH-70 of Britain, West Germany and Italy, and the FH-77 of Sweden.

The GSDF has proceeded with negotiations with these countries since it dispatched a survey mission abroad in FY 1978.

New howitzers are planned to replace the current Model 75 155mm self-propelled howitzer and towed howitzers.

For the self-propelled type, the GSDF will purchase 155mm barrels and 155mm ammunition for the new howitzers in FY 1982 and start modification of the Model 75 bodies in FY 1984. New self-propelled howitzers will actually be deployed several years after FY 1985. However, deployment of the new towed howitzers will begin in FY 1984.

CSO: 4120

MILITARY

FRAM PROGRAM: TWO SHIPS TO BE MODERNIZED IN FY '81

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 7-8

[Text]

The Maritime Self-Defense Force (MSDF) plans to install antiair and antiship missile systems aboard two older destroyers in FY 1981 under its Fleet Rehabilitation and Modernization (FRAM) program. During the period of the present Medium-Term Defense Program (FY 1980 - 84), the MSDF plans to modernize six older destroyers by installing new missile systems.

At present, the MSDF has 48 destroyers and frigates operating in four escort flotillas. Most of them are equipped with Bofor and antisub rockets for antisubmarine operations as well as 5-inch guns for main armament. Only four missile-carrying ships are in service with the MSDF at present.

The MSDF and the Defense Agency have now decided to arm all new destroyers with modern guided weapons and to update older ships with such missile systems as the Sea Sparrow and the Haprpoon. Electronic countermeasure equipment will also be installed.

Two 3,100-ton Takatsuki class destroyers and four 4,700-ton Hiei class helicopter-carrying destroyers will be upgraded under the FRAM program. Modernization of each ship will cost approximately ¥10,000 million, but this will enable the MSDF to extend the ship's service life for about eight years, sources say.

All warships to be commissioned in and after FY 1981 will be armed with antiair and antiship missiles, and more than half of the Japanese destroyers with be equipped with various types of missiles including the Tartar in or after FY 1985, according to MSDF sources.

CSO: 4120

MILITARY

ASDF TO PROMOTE ASIP FOR F-4EJ AIRCRAFT

Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 p 5

[Text]

The JDA has reportedly requested approximately ¥2,800 million in the FY 1981 defense budget draft for modernization of the ASDF/McDonnell Douglas F-4EJ fighter interceptor aircraft.

The ASDF has been authorized by the National Defense Council, the top defense policy maker of the Japanese Government, to maintain 100 F-15 aircraft by the end of the present Medium-Term Defense Program (FY '80 - '84).

Including the F-15 force, the ASDF will be permitted to maintain ten interceptor squadrons. Due to phasing out of the F-4EJ which was originally expected to begin in FY '84 - '85, however, the JDA and ASDF have been studying methods to effectively maintain the 10-squadron interceptor setup. An additional purchase of the F-15 was once considered ideal but this will not be approved for the current MTDP. In the circumstances, the JDA and ASDF believe that improvement of the present F-4EJ is the second best choice.

The ASDF is expected to introduce the F-4 Aircraft Structural Integration Program (ASIP) being used by the USAF for controlling fatigue on its Phantom aircraft. Pending approval, the ASDF will begin procurement of precision measuring equipment to determine strength and fatigue of major parts and components of the airframe and the engine and development of programs to process data which will be acquired through the equipment.

In addition to ASIP, the ASDF plans to upgrade the F-4s by installing new fire control systems, new radar with "look down" capabilities and equipment to fire advanced air-to-air and air-to-ship missiles, sources say.

The JDA and ASDF hope the F-4EJ improvement program will be approved by the Ministry of Finance without major modifications because of its excellent cost effectiveness.

CSO: 4120

BRIEFS

P-3C'S AT ATSUGI--The Japanese Defense Agency officially informed the Kanagawa Prefectural Government and city authorities of Yamato and Ayase through the Defense Facilities Administration Agency (DFAA) last week that the Maritime Self-Defense Force (MSDF) will station eight Lockheed P-3C antisubmarine patrol aircraft at Atsugi MSDF Air Base in FY 1981-82. The DFAA will begin construction of facilities necessary for deployment of the aircraft at Atsugi soon. Under the current P-3C program, the MSDF will introduce 45 aircraft and station them at such bases as Hachinoe in Aomori Prefecture and Kanoya in Kagoshima Prefecture in addition to Atsugi. Atsugi will become the main base of the MSDF P-3C force and will be equipped with central data processing facilities, which will process all data and information supplied by its P-3Cs. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 pp 5-6]

SHORT-RANGE TORPEDO--The MSDF/TR&DI have earmarked about 600 million yen in a budget request for FY 1981 to continue research and fabrication of the GRX-3 antisubmarine short-range torpedo during the year. In the FY 1980 budget, about 260 million yen is planned for research and fabrication of GRX-3 components and about 220 million yen for fabrication of homing torpedoes. The GRX-3 program will be carried out in parallel with modification of Model 73 short-range torpedoes. Modified Model 73 torpedoes will be mounted on P-3C antisubmarine patrol aircraft. The first three aircraft will be acquired by the MSDF in FY 1981 under a foreign military sales (FMS) contract with the United States. Development of the GRX-2 long-range torpedo will also continue in FY 1981. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 p 9]

CSO: 4120

ECONOMIC

BANK OF JAPAN, PLANNING AGENCY ANALYZE ECONOMY

OW141121 Tokyo KYODO in English 1055 GMT 14 Oct 80

[Text] Tokyo, Oct 14, KYODO--The Japanese economy has moved into the phase of expansion, although the tempo of recovery is still extremely slow, the Bank of Japan said Tuesday.

In its monthly report on domestic economic and monetary conditions, the central bank said some economic indicators are still unfavorable.

The bank said, for instance, personal consumption spending is remaining sluggish and inventory liquidation is slow in some industries.

But plant and equipment investments are holding strong along with exports, it noted. In addition, profit-earning performance of corporate firms is favorable.

Judging from these factors, present conditions of the domestic economy cannot be described as bad, bank officials said. The economy appears to be already in the phase of slow expansion, they added.

Meanwhile, the Economic Planning Agency (EPA) said signs of economic slowdown are evident throughout the country. The EPA said it had found this out at meetings it held in 11 major cities across the nation to survey conditions of regional economies.

At the regional meetings, held in September, strong concern was expressed by participating businessmen over present domestic economic conditions, the EPA said.

Signs of economic slowdown were especially noticeable in areas heavily dependent on public works projects and affected badly by the cool summer, it said.

The participants of the meetings thus expressed the hope that the government will enforce strong business-stimulating steps, including another cut in the Bank of Japan's official discount rate and promotion of fiscal spending on public works projects, according to the EPA.

They also said the government should do its best to stabilize consumer prices as soon as possible to stimulate consumer spending, it added.

CSO: 4120

INDUSTRY HEADS TO MEET BOEING OFFICIALS

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 1-2

[Text]

Executive directors of three major Japanese aerospace companies, Kenji Ikeda of MHI, Teruaki Yamada of KHI and Iwao Shibuya of FHI as well as Vice Chairmen Kenji Uchino and Eiichi Yamaguchi of the Civil Transport Development Corporation (CTDC) are scheduled to leave for Seattle, Washington, October 15 for talks with top officials of Boeing Commercial Airplane Co. on issues related to development of a new medium size passenger aircraft coded here as the Y-XX.

Chairman F. Swarttouw and F-29 Project Manager J. Cornelis of Fokker Aircraft Co. were in Seattle in the middle of September, contacting Boeing on a possibility of developing the F-29 with the American company as well as Japanese industry on an equal partner basis, according to local industry sources. Boeing has reportedly organized a special team to study Fokker's proposal and the team is expected to conclude its findings in the middle of October, they say.

Since Swarttouw and his team were in Tokyo last month and made a proposal on joint development of the F-29 with Japan and Boeing, the industry has to reply to the Dutch company in some manner. Considering the close relations with Boeing on development and production of the 767 aircraft (coded here as the Y-X), Japanese industry leaders want to hear Boeing's views on the Dutch proposal.

When T. A. Wilson, Chairman of the Boeing Co., was in Japan in March 1980, he told top officials of MITI that Boeing would be ready to talk with Japanese industry leaders if Japan wanted to develop a new medium-class aircraft on an international collaboration basis.

Japanese industry leaders, who visited Seattle in the middle of August and discussed the Y-XX joint development possibility, reportedly refrained from making any definite proposals acceptable to the American company.

In present circumstances, it is seen as difficult for the Japanese to predict what will result in the coming talks with Boeing officials in Seattle, industry sources say.

CSO: 4120

SHIN MEIWA IN DANGER OF LOSING FLYING BOAT BUSINESS

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 2-4

[Text]

Shin Meiwa Industry is in danger of loosing its flyingboat manufacturing business as the Maritime Self-Defense Force (MSDF) has decided to stop procurement of Shin Meiwa PS-1 antisubmarine patrol flyingboats after no progress in the firm's scheme for developing commercial flyingboats.

The reason for the MSDF's suspension of PS-1 procurement is that the ¥5,000 million flyingboat is less cost efficient than the sophisticated P-3C antisubmarine patrol aircraft, priced at about ¥9,000 million, which the MSDF is going to introduce. Shin Meiwa will manufacture only US-1 rescue amphibians for the MSDF after suspension of PS-1 production.

Prior to the PS-1 production suspension, the company considered developing new commercial flyingboats two years ago. It has been seeking collaboration with West German and Canadian manufacturers in the scheme. The Society of Japanese Aerospace Companies (SJAC) has also prepared a recommendation on development of new commercial flyingboats, envisaging a 30-to-50-seat amphibious aircraft equipped with a turbofan engine. It has estimated development cost at ¥37,000 million with demand in Japan and Southeast Asia projected at more than 870 aircraft.

However, other Japanese aircraft manufacturers remain reluctant to agree with the recommendation. Executives of major aircraft manufacturers such as Mitsubishi Heavy Industries, Kawasaki Heavy Industries and Fuji Heavy Industries have doubts about profitability, saying the projected demand is too optimistic. Flyingboats are less fuel efficient than other aircraft because of greater weight and a turbofan engine will boost its price, they said. Users would be reluctant to purchase such an inefficient aircraft, they added.

Aircraft industry leaders also said it would be difficult to request additional government subsidies because the industry is now handling big government-subsidized projects, including the Japan-US-Italy Boeing 767 program, the Japan-Rolls-Royce RJ500 aero engine project, experimental STOL (short takeoff and landing) aircraft development, the experimental FJR jet engine program and the incoming Y-XX medium airliner project.

Although SJAC hopes to materialize the flyingboat development project, Shin Meiwa sees a gloomy future. Although the firm is Japan's fourth largest aircraft manufacturer, its business is limited to amphibious aircraft production. It fears that its technology would be lost unless a new project surfaces.

Meanwhile, the MSDF plans to procure 10 US-1 rescue flyingboats, of which orders for seven have been placed with Shin Meiwa. An order for the eighth US-1 will be awarded in March 1981 or at the end of FY 1980. The last three aircraft will be used as reserves. Although the ninth order had been planned for FY 1983, the MSDF is expected to push it ahead one year to FY 1982 to minimize problems which Shin Meiwa will face because of a production blank. The 10th order is expected for FY 1983.

The MSDF is still studying future operational requirements for the US-1, including a long-range rescue mission. In case long-range mission capability is required, the US-1 would have to be modified or a new aircraft would have to be developed. The MSDF is expected to complete its study by next summer. This study also covers procurement of PS-1 spare parts.

Although suspension of PS-1 procurement will reduce Shin Meiwa's aircraft production operation, the MSDF said it cannot give the company orders for other aircraft or parts.

CSO: 4120

ECONOMIC

PROGRESS REPORTS ON F-15, P-3C PRODUCTION PROGRAMS

Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 pp 3-4

[Text]

The Japanese aircraft industry has now started assembly of knockdown sections of F-15 fighters and P-3C antisubmarine patrol aircraft prior to license production.

The first knockdown F-15 has entered the final stage at Mitsubishi Heavy Industries' (MHI) Komaki Minami Works in Aichi Prefecture. This is the third F-15 to be delivered to the Air Self-Defense Force (ASDF), following two complete aircraft being imported from McDonnell Douglas Corp. Knockdown components for this aircraft, including front, middle and rear fuselage parts, main wings and tail assembly, arrived last spring. Sections for the second knockdown aircraft have also arrived. The first knockdown F-15 will commence flight tests in July 1981 with the fire control system and other systems being mounted from now. Delivery to ASDF is scheduled for the end of 1981.

MHI will assemble eight knowckdown F-15s and then produce 78 aircraft under license over 10 years. The ASDF will procure 100 F-15s, including 14 aircraft that will be imported.

MHI's Komaki Minami Works is now also manufacturing the last or 140th F-4EJ Phantom fighter. The F-4EJ will gradually be replaced by the F-15 as ASDF's mainstay fighter.

As for the first knockdown P-3C, Kawasaki Heavy Industries' (KHI) Gifu Works in Gifu Prefecture is proceeding with assembly of middle fuselage sections at present. This will be followed by fuselage tests before key electronic devices are installed. KHI will receive equipment for the test from Lockheed Aircraft Corp., early next year. Installation of such electronic devices as data processing systems and infrared detection systems will begin next spring and the first knockdown P-3C will make its first flight in late 1981. Delivery to the Maritime Self-Defense Force (MSDF) will start in May 1982.

While assembling four knockdown P-3Cs, KHI will manufacture parts for license production from next year. The MSDF will purchase 45 P-3Cs--four knockdown aircraft, three finished aircraft by import and 38 aircraft from license production.

CSO: 4120

FHI ASKS JDA FOR LICENSING PRODUCTION OF BELL AH-1S

Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 p 4

[Text]

Fuji Heavy Industries Ltd. (FHI) has officially asked JDA for approval to start domestic production of the Bell AH-1S antitank helicopter for the Ground Self-Defense Force in FY 1982.

FHI maintains that domestic production of the antitank helicopter under license from Bell will help promote advanced technology related to antitank warfare, and that production will lead to development of improved airframes and new airborne weapons systems. The unit price of the helicopter to be imported either through the FMS or commercial channels may appear cheaper than those produced under license at first, but domestic production will be better for the operator if future supplies and technical support are taken into consideration, it states.

It adds that domestic production will also more suitable to the annual budget system, in which a small quantity of aircraft is contracted every year.

In addition to these factors, the US Army is expected to end procurement of the AH-1S after 1981 and FY '82 appears to be the last chance for Japan to commence production of the helicopter under Bell license, FHI says. American vendors in the US Army AH-1S program also want an early Japanese decision so that they can draft future plans for maintenance of production lines and personnel, the company adds.

GSDF has purchased two AH-1S helicopters for evaluation purposes. The GSDF Aviation School which was entrusted with evaluation work completed all tests in June and a final report will be submitted to the JDA by the Ground Staff Office, GSDF, soon. GSDF plans to procure 56 AH-1S helicopters and to organize 3.5 antitank air units, pending final approval.

CSO: 4120

ECONOMIC

BRIEFS

NATIONAL ENERGY DEVELOPMENT AUTHORITY--Tokyo, Oct 1, KYODO--Japan Wednesday officially launched its full-scale exploitation of alternative energy sources with establishment of the National Energy Development Authority of Japan (NEDA). Its branch offices also opened in Washington and Sydney. In an inauguration ceremony at the Sunshine Building in Tokyo's Ikebukuro, Tsutomu Watamori, vice president of Hitachi Ltd., became director, leading 336 executives and staff members chosen from the government and about 30 steel, electric and other energy-related enterprises. The authority has a total fiscal 1980 budget of yen 17.6 billion (about $83 million) for the development of coal liquefaction, solar powerplants, geothermal heat and exploitation of overseas coal mines. Through this program, Japan hopes to reduce dependency on oil, now accounting for 75 percent of the nation's total primary energy source, to less than 50 percent by 1990, officials said. [Text] [OW031155 Tokyo KYODO in English 0456 GMT 1 Oct 80 OW]

FOREIGN EXCHANGE RESERVES--Tokyo, Oct 1, KYODO--Japan's foreign exchange reserves increased dollar 720 million during September to reach dollar 23,768 million at the end of the month, the Finance Ministry said Wednesday. This represented the sixth straight monthly gain. This also meant that the nation's foreign exchange reserves increased by dollar 5,225 million during the past six months, the ministry said. The ministry attributed the September increase to the smooth influx of foreign funds through the operation of the reserves. The Bank of Japan also bought a large amount of U.S. dollars to cope with the appreciation of the yen against the U.S. currency, it added. Meanwhile, Japan had the world's sixth largest foreign exchange reserves of dollar 22,793 million at the end of July. West Germany continued to top the list with dollar 55,230 million, followed by France, Italy, Britain and the United States in that order. [Text] [OW031155 Tokyo KYODO in English 0850 GMT 1 Oct 80 OW]

TRADE CONTRACT WITH LIAONING--Tokyo, Oct 1, KYODO--An electronic plant in China's Liaoning Province will produce tape recorders for a Japanese company under the processing trade formula based on a recent Chinese decision to enhance the autonomy of local governments, it was learned here Wednesday. According to informed sources, Sanwa Denki Kohyo K.K., a small electric appliance maker based in Yamagata, northeastern Japan, recently signed a three-year processing trade contract with the Liaoning branch of the China National Light Industrial Products Import and Export Corporation, the Liaoning Electronic Industry Corporation and the No. 3 Liacning Electronic Factory in Yingkou City. Under the contract, which took effect Wednesday, Sanwa will supply some yen 297 million worth of portable tape recorder parts to the No. 3 Liaoning Electronic Factory and import finished and semifinished recorders for about yen 459 million for re-export to Taiwan and Hong Kong. The sources said the Chinese move apparently reflects the Beijing government's recent decision to leave decisions on small-scale joint business undertakings to the discretion of local governments. [Excerpt] [OW031155 Tokyo KYODO in English 1107 GMT 1 Oct 80 OW]

TAX REVENUES--Tokyo, Oct 7, KYODO--Tax revenue in August totaled yen 2,259.6 billion, up 17.4 percent over the year before, according to the Finance Ministry. This brought the April-August total to yen 7,467.6 billion, 28.3 percent of the estimated tax revenues for fiscal 1980. The ministry said collection of corporate tax made a good showing as Toyota Motor Co. paid some yen 120 billion tax in the month, but revenues from commodity, liquor and auto weight taxes and custom duties fell short of year-before levels. [Text] [OW070833 Tokyo KYODO in English 0225 GMT 7 Oct 80 OW]

EXPORT LETTERS IN SEPTEMBER--Tokyo, Oct 2, KYODO--Export letters of credit received in September totaled dollar 7,371 million, up 22.3 percent from the year before, the Finance Ministry and the Bank of Japan said Thursday. The ministry and the bank attributed the large gains chiefly to continued high-level exports to Europe. Another reason is that the number of business days in September was one day more than in the like month of last year. The rate of increase, adjusted for seasonal variations, was 18.2 percent. Exports of electric machinery were up 35 percent from the year-before level and automobiles, up 29 percent. Exports to the Mideast, Europe and Asia, in particular, recorded an appreciable increase. By region, exports to Europe soared 41 percent from the year before--the largest percentage gain. Exports to Asia and the Mideast also increased steeply. On the other hand, exports to the United States registered a small 8 percent increase. Exports of steel products to the U.S. were down 10 percent. Exports of general machinery were up only 2 percent. In contrast, auto exports to the U.S. were up 11 percent. [Text] [OW031215 Tokyo KYODO in English 0337 GMT 2 Oct 80 OW]

INCREASE IN JDA PROCUREMENT--The Japanese Defense Agency's (JDA) domestic procurement of defense equipment in FY 1981 will increase by more than 10 percent over the previous fiscal year, according to the JDA and defense industry sources. The JDA submitted to the Ministry of Finance a FY 1981 budget request totaling ¥2,446,500 million, which the sources said includes ¥785,100 million for purchase and maintenance of defense equipment. Even after the MOF's probable cuts, the equipment outlay will be at least ¥750,000 million, an increase of more than 10 percent over the current fiscal year. Of the equipment outlay, funds for equipment from the domestic defense industry total ¥650,000 million, which is a double-digit increase. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 pp 2-3]

CSO: 4120

XF-3 TURBOFAN ENGINE DEVELOPMENT PROGRAM

Tokyo JPE AVIATION REPORT-WEEKLY in English 15 Oct 80 pp 8-9

[Text]

The Technical R&D Institute (TR&DI) reports smooth progress in its XF-3 turbofan engine development program. It is fabricating five engines in the current fiscal year for various tests after the XF-3-20, delivered to TR&DI in the spring of 1979 by Ishikawajima-Harima Heavy Industries (IHI), achieved thrust of 1,660 kilograms in December 1979. The XF-3 engine is designed for the MT-X medium jet trainer to be developed.

The project is based on jet engine research data of TR&DI's 3rd R&D Center and IHI since development of the existing J-3 engine.

The first XF-3 engine was fabricated in FY 1975. The XF-3-1 has been used for rapid acceleration and deceleration, inlet distortion, outdoor noise, low temperature and other tests. Following the XF-3-1, the XF-3-20, a modified version, was fabricated in FY 1977 and 1978. Running tests started in the spring of 1979 and the traget thrust was achieved in December 1979. Total running hours of the two test engines exceed 500 hours.

Future tests for demonstrating reliability will have to cover various aspects, including ground performance, high-altitude characteristics, operational and environmental flexibility, fatigue and antipollution. Specifically planned are airborne tests to be conducted on a modified C-1 transport as a flying test bed.

Important requirements of the new jet engine include fuel efficiency and low production costs as well as high performance and reliability characteristics.

CSO: 4120

TR&DI'S MAJOR PROGRAMS FOR FY 1981 OUTLINED

Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 pp 6-8

[Text]

Outlined below are major research and development programs related to aircraft, missiles and avionics, which the JDA's Technical R&D Institute (TR&DI) will carry out in FY 1981:

* MT-X Medium Jet Trainer

The MT-X program will begin with basic design in FY 1981 at request of the ASDF. The new trainer is planned to cover training missions of both the T-33 and T-1. The JDA has requested about ¥2,398 million for basic design lasting until FY 1982. The total cost for the program is estimated at ¥40,000 million. An experimental aircraft will be fabricated by FY 1986 with detailed design starting in FY 1983 for flight tests in FY 1987. A small turbofan engine, being developed by TR&DI and Ishikawajima-Harima Heavy Industries (IHI), is almost certain to be adopted. The final decision will come at the end of FY 1982 before detailed design. The engine's thrust is planned at 1.66 tons.

* Small Turbofan Engine

The JDA has requested about ¥2,550 million for fabrication of five test engines from FY 1981 in addition to another five being fabricated from FY 1980 to 1982. This request is almost certain to be approved. The 10 test engines, based on two prototype units fabricated and tested by the TR&DI and IHI from FY 1975, will be used for pre-flight rating-testing (PFRT) from the latter half of FY 1981 to the middle of FY 1983. Based on PFRT data, the TR&DI will consider the possibility of the engine being mounted on the

MT-X. PFRT will consist of running tests (27 months), distortion tests (14 months), over-rotation and excessive temperature tests (16 months), FTB (flying test bed) tests (16 months), ATF (altitude test facility) tests (12 months), ice ingestion FOD (foreign object damage) tests (12 months), sand and bird ingestion FOD tests (12 months) and 60-hour calibration tests (six months).

* ALQ-5 ECM System

The ALQ-5 ECM (electronic countermeasure) system for ASDF is designed to be installed on the C-1 transport for ECM training against ground site and surface-to-air missile (SAM) radars. Main parts are being fabricated from FY 1979 to 1981.

* New Radio Equipment

Development of new field radio equipment will start in FY 1981 at the request of GSDF. The new radios will be used for command and communications in place of existing sets. They will feature excellent ECM performance, digital data communications, facsimile transmissions, and other functions. Under the development program lasting until FY 1982, TR&DI will fabricate eight units for vehicles, six portable units, two units for aircraft and two units for repeater facilities.

* Air Combat Missile

The TR&DI has been studying a new air-to-air missile (AAM) for the ASDF at its Third R&D Center since FY 1978. The airframe, rocket motor and servo combustion devices will be fabricated in FY 1981. The new infrared ray homing AAM, to be used with fighters, will be designed to outperform the Sidewinder AIM-9L for the F-15 fighter.

* Control-Configured Vehicle (CCV)

An ASDF T-2 trainer will be converted into an experimental aircraft with direct lift and other new controls to collect data for developing CCV technology. Fabrication of a fly-by-wire computer system and modification of a T-2 will follow manufacture of the electric control system, air combat flaps and canards from FY 1979 to 1981. In the modification, flaps, horizontal canards and vertical canards will be installed on the T-2. Flight tests will be held from the first half of FY 1983 to 1985.

* Portable Surface-to-Air Missile (SAM)

The portable SAM program has been funded since FY 1979. An experimental airframe and guidance systems will be fabricated for development of the image homing portable SAM, which the three SDF services will use as defense against intruding aircraft. The new portable SAM is designed to replace the Stinger which ASDF and GSDF have requested for FY 1981 under the FY 1980-84 Medium-Term Defense Program. The Stinger depending on visible radiation for image homing guidance has no all-weather capability, but, the new portable SAM will have an infrared sensor to cover missions in bad weather.

* Precision Guided Simulator

The TR&DI will complete a new precision guided simulator in FY 1981 with a central control system, computer and other newly fabricated components. The simulator, which will become operational in FY 1982, will be used for research and evaluation of future advanced missile systems at the Third R&D Center.

* Electronic Warfare Simulator

The TR&DI will start fabrication of electronic warfare simulators in FY 1981 on the basis of research carried out in FY 1979 and 1980. These simulators will be used for evaluation of various future electronic warfare systems and development of ESM, ECM and ECCM technology necessary for increasing electronic warfare capability. ECM and ECCM subsimulators will be built in FY 1981. They will be completed in FY 1983 for operation at a radiowave absorbing room to be built at the First R&D Center. Funds needed for construction of the room have been requested for FY 1981 together with those necessary for simulator fabrication.

* Future Fire Control Systems (FCS)

An antenna for a fire control system will be fabricated from FY 1981 to establish the active phased array technology. This will precede development of new aircraft FCSs which can cope with low-level supersonic aircraft attack and simultaneous intrusion of many aircraft.

These systems must be suitable for CCV aircraft. A basic FCS development program will be prepared from FY 1983 after evaluation of the antenna in FY 1981 and 1982.

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SCIENCE AND TECHNOLOGY

TR&DI TO DEVELOP SCOUT-RECONNAISSANCE APC FROM FY '82

Tokyo JPE AVIATION REPORT-WEEKLY in English 22 Oct 80 p 9

[Text]

The JDA's TR&DI will delay technical development of a scout/reconnaissance vehicle for the GSDF until FY 1982, although it had originally been planned for FY 1981.

The TR&DI has already completed a wheeled armored personnel carrier (APC) with sensors and a 20mm machine gun system as an experimental scout/recommaissance vehicle. However, cautious opinion has prevailed that further consideration of evaluation results for the fabricated vehicle is necessary before technical development because higher requirements may be necessary.

From FY 1980 to 1981, suitable requirements will be prepared with especially the vehicle's weapons in mind, according to informed sources.

The TR&DI has also fabricated a command/communications vehicle for GSDF. This APC will be adopted after technical and operational tests in FY 1980 and 1981 with procurement planned to start in FY 1982.

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END

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NEW, FUTURE TECHNOLOGY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 3, 6-16, 20-37, 48-73, 75-89, 90-137, 149-189, 191-218

[Selected articles from special issue of SHUKAN DIAMOND entitled "New and Future Technology Reader"]

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PREFACE TO SPECIAL ISSUE ON FUTURE TECHNOLOGY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 p 3

[Preface by Norio Murakami, editor in chief]

[Text] As the 80's close in, the importance of new technological development has become even greater. Last spring, a special edition "Japan's Future Technology 700" was published based on data from the Science and Technology Agency, and it was received with much greater enthusiasm than expected. At the same time, there were many requests for even more technology prediction publications.

Fortunately, the monograph "Predictions of Technology and Industrial Structure '78" was fortuitously put out by the Research Institute of Industrial Materials which has risen to the foreground as a private think tank of considerable authority. This issue is an attempt to present that monograph in a more easily readable form.

The Research Institute of Industrial Materials is a survey organ funded by many big businesses and has in the past been submitting reliable data to various government agencies and bureaus as well as to many firms and organizations. This new "Predictions" was compiled as an effort to commemorate this organ's 15th anniversary. This present survey delves much deeper than the survey put out 5 years ago by the same organ and was compiled as the result of detailed questionnaires sent out to close to 900 leaders of government agencies, private industry, and research organs. The answers have been used to predict what the industrial environment and production structure will be between 1980 to 2005, taking into account government, economic, and social factors. In addition, more than 700 items of future technology are projected in yearly increments. Furthermore, each technology item also gives the probability of practical realization and lists an evaluation of whether the technology will benefit society along with conditions promoting or hindering it, the appropriate development entity and funding source as well as components, materials, machinery and equipment, buildings, systems and services required. Hence, we believe that when this compilation is used together with the aforementioned special publication of the Science and Technology Agency, valuable information will be obtained. We will be greatly rewarded if this new compilation is accorded the same reception as the other publication.

2267
CSO: 8129/1906

JAPAN'S TECHNOLOGY AND INDUSTRIAL STRUCTURE WILL CHANGE IN THE FOLLOWING MANNER IN THE 80'S--NEED FOR SUPRA-INDUSTRY TECHNOLOGY DEVELOPMENT SYSTEM

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 6-9

[Article by Masato Nebashi, managing director of the VLSI Technology Research Association]

> [Text] It is said Japan's industrial and technological environmental structure will change greatly in the 80's and beyond. Will that be so? The author is a former technology councillor for the Agency of Industrial Science and Technology who is presently a leader in the joint government-private VLSI development organization. This is why his comments based on his wide background were solicited.

The Japanese Economy Which Is Approaching Maturity

Basically speaking, our country is one which imports raw material and exports manufactured products and is a country which exists on manufactures trade. This is because a hundred million people must exist on this narrow land, this land is not blessed with natural resources, and this is, in a sense, an inevitable approach.

On the other hand, the makeup of this manufactures trade country made possible the emphasis of putting capital into areas which were comparatively more efficient than resources development, which required large facilities for material production, and machine industries with continuous production and automation and with less risk during the past years when there were essentially no limitations to the import of resources.

This system created an environment of mutual relationships between shipbuilding, steelmaking, chemical, household electric, and automobile industries to expand toward (greater scale → lowered price → increasing demand), and it made possible Japan's sudden economic and industrial growth. At the same time, this production technology has made possible the import of technology cheaply at a time after the war when there was such a large difference in technology levels. This enabled a pattern in which the first unit was an imported manufactured, the second unit was produced domestically through technology import, and then there was the ever present improvement in a pattern that fashioned this rapid advance.

As a result, Japan was able to rise from a state of a have-not nation directly after the war to build up a production technology system that was superior even on a worldwide basis, based on imported technology. While all this was going on, the per capita national income came up to the high income level of the Western world while the people's living standard was such that color television, refrigerators, and washing machine type household electric appliances became commonplace to even surpass the level of the industrial European countries. Although the wide use of automobiles still has not come up to the level of the Western world, Japan ranks second to the United States in car ownership.

When one considers this development of Japan's industry and technology, one wonders whether today's economic and industrial stagnation is simply the result of the oil crisis and the subsequent changes in the international environment such as worldwide recession, low growth, and spread of resources nationalism.

The changes in the international environment triggered by the oil crisis definitely have had very great effect on this manufactures trade country which is very evident; however, does this not mean in a more fundamental sense that the development of Japan's economy has now entered a stage of "maturity."

At the same time, it may also be said that the postwar development with its main thesis of "overtaking" the leading Western countries is now at an end. To be sure, this term "maturity" is not synonymous with complete. While this may be similar to "keeping up with the Jones'" we have pursued our needs to the stage that we feel a sense of sufficiency volume wise, and the necessary production technology to this end has been acquired.

A Turnaround in the Technology System Is Important

Now what are the relationships between the changes in Japan's economy and technology?

When regarded individually, technology basically is always striving to up its performance and develops and changes almost independently of the economic and social situations.

On the other hand, modern technology is not one of isolated technologies but one of closely intertwined technologies which overall comprise a high-level organic body. At the same time, this technology system is intimately and indispensably tied in with the nation's economy and production structure.

While it may be thought that changes in level of this type of technology system at first glance may appear as a rise in technology level reflecting the advances and development of individual technologies, they also appear as changes in structure or reorganization corresponding to changes in the economy and society. Consequently, it may be only natural to say that Japan is now at a stage in which its technology system must undergo a turnaround just when the national economy is entering a stage of "maturity" and is attempting to change its quality and structure.

There was not much thought directed in the past in this country to treat technology as a system or to place technology in its proper perspective within the overall system. This was because the technology system of the leading Western countries came over intact, and Japan has been eyeing these systems. When a certain plant maker imported foreign technology, he found. in the specifications, instructions to use a pump made by another country's manufacturer. While troubled, he took a closer look whereupon he found that this pump was one manufactured in Japan as the result of technology import. The maker was said to be greatly relieved. Despite the fact that only separate technologies were considered, Japan's industrial technology conducted average import and development as a result of which development was realized without too much excesses.

The Four Conditions for the "Japan Type Technology System"

If as mentioned before, the "maturity" of Japan's economy enabled the catch-up to the leading Western countries, it can be said that the day has come when Japan must proceed on the basis of its own independent system. Figuratively speaking, this is a shift from a "digest of leading industrial countries' technology system" to a Japanese type technology system.

Just what kind of changes are these?

First of all, they are based upon Japan's social conditions.

While it may be said that the popular acquisition of material things has risen to a fairly high level, social environmental conditions such as homes, traffic, pollution, environment, medical treatment, and good living are still inadequate, and it is expected that needs in these directions will continue to increase. It is thought that the role technology will play in resolving these problems is great, but the reason technology is delayed despite its great need is that the technology has to be compatible with this country's social system.

For example, even when a new traffic system is to be considered, not only must the capabilities of the automobile be considered, but the road network, flow of materials, traffic regulation, and even radio utilization must be included. The different system developed separately then comes to be incorporated, and unless the data accumulated along the way and the overall handling of the technology are expedited, the desired system may not be possible.

To be sure, this type of overall viewpoint should also be applicable to systematic technology development in its entirety. In the case of the one to one relationship between producer and consumer of the past, it ultimately resolved itself to a physical or cost problem. When a subject of strong tie-in with social systems is involved, there are times when the good or harm to society comes into play. This alone may result in need for comprehensive public acceptance or technology acceptance. Just as the introduction of automobiles results in the construction of roads, there are times when renovation of the present social system may result.

Secondly, the natural conditions of Japan are included. Corresponding to resources nationalism, the Sunshine Plan must be promoted and improved self-sufficiency in food must be sought to insure security. On the other hand, a technology aimed at such multiply faceted and complex natural conditions will be a completely opposite system to the technology system of Japan to date which is designed to produce uniform materials using high quality raw materials and producing goods with high productivity.

For example, should mechanized farming be adopted to increase productivity, there will be need for technology different from what was used in the past. There will be need for data to provide the optimum conditions for industrial growing, but the growth of plants vary with the individual plants, and the manner in which these growths are measured and controlled will necessitate the development of science and technology (biology, agriculture) that will be the basis for an industr'al technology level.

This situation also applies to geothermal energy sources. Geothermal energy is an important domestic energy source which is expected to be developed from here on, and even the prospecting methods have as yet to be adequately developed. Just what to measure, where to measure, and what will be learned are geophysical and geochemical research items which need resolution.

This incorporation of natural conditions involves knowledge of the structure of nature itself. In other words, the development of natural science and its interflow have to be learned. At the same time, it is no mistake to say that natural science must be able to respond to the needs of technology and be a prime driving force for development without having to go as far as thermodynamics.

Thirdly, cultural and natural conditions must be incorporated. While there may be sufficiency along some lines, there will be multiplicity in needs. There will be shift in emphasis on technology and development from production oriented to market oriented. On the other hand, these needs are not thought to change even when the present recession goes away if one looks at the present international environment that emphasizes conservation of resources and conservation of energy. Such being the case, simply changing what is directly at hand will not suffice.

Among these items there will be some unique items which reflect Japan's culture and natural conditions as well as its multiple living patterns including motorcycles or bicycles which women can operate simply, electric cooker, comforter dryer, and computers which can input Chinese characters.

In any event, the technology development should be selected so that progress can be made from the efficiency of production of the past in a so-called home ground manner to some other selected level by analyzing the directions in complex and multiple needs and extracting the target subject and thereby advancing toward more difficult levels.

Fourthly, there is the need to fit this country into international conditions. When viewed from the angle that Japan is a manufactures trade country, past development, which used mass production technology as a weapon, has reached its limit and will not go any further. Japan is being pursued by other countries which are promoting industrialization. Considering the fact that Japan's resource is brain power, the path of advance of this country in such a situation is in the development of products of high technological intensity, and a so-called country based on technology focused on this type of technology development power is the direction to take.

Problem Points in the Promotion of Technological Development

As discussed to this point, the transition to a "Japanese type technology system" starts from the awareness of Japan's special features. This technology has hold of a uniform market of 100 million people which is not small even on a worldwide scale. This is why the demand from the world outside of Japan may become smaller than what it was in the past because of these unique features. On the other hand, it will possess a unique export capability with no friction. It is thought that today's high class cameras come close to this situation.

In addition, the manner in which aid is given developing countries will see the experience gained in establishing the "Japanese type technology system" make possible the development of technology systems suitable for the social system of the developing country thereby enabling effective aid.

In order to develop and change the present technology system to adapt to these new directions, there is need, naturally, to promote various technology developments. These efforts bring up a number of problems.

The first major problem is the capability of private industry which plays the major role in research and development for shouldering research and development. As was indicated in the Agency of Science and Technology White Paper, the recent recession has seen a decrease in research funds per researcher, and the decrease in basic research funds has been particularly severe. While this situation is actually so, the entire industrial world of Japan does not fare too badly upon comparison with the other leading countries where research funds are concerned. There are rather few companies which are far below the average.

In the promotion of future independent development, there will be some subjects of which there are no previous examples or subjects such as nuclear fusion power generation in which not only the theoretical aspects but the technological feasibility have not been established. This is why natural science and engineering are important, but the necessary interchange of scientists and technological researchers and desirable relationships between universities and industry are far from being adequate.

Thirdly, the evaluation of the reliability of the judgment whether technology development has been attained is important. As is particularly evident in material development, it has been the practice in the past to follow objective evaluation standards based on foreign specifications, but it is expected that there will be need for research on evaluation methods and the evaluation organizations.

Fourthly, research and development will require even longer periods in the future (according to the Science and Technology Agency White Paper, there is an average of 5.9 years from basic research to industrialization). Despite this situation, there is the problem of subject selection which is further complicated by the multiplicity of needs thereby resulting in somewhat contradicting situations.

A large array of problems was discussed above, but I myself regard the situation with an optimistic view. This is because the possibilities opened up by the different technologies of the present have not been fully exploited. When one considers the great potential to be realized through the organic organization of these different potentials, it may be called the "valleys between technological innovations." This is because there has as yet not been the need for that many seeds.

Increasing Need for Joint Development System

Now how do we promote this research and development which is associated with so many problems?

Taking the case of communication technology which is intended to provide man to man communication, technology always requires material things such as tools or machines which are produced by industry. In this sense, it may be said that technology falls into the hands of industry. On the other hand, this does not mean that all of today's technological development will be at the hands of industry and business. This may have been possible in the 19th century, but it is not possible today.

On the other hand, there are limitations to relying on the government, and there may be need to consider some more reasonable responsibility relationships.

The areas where the country should contribute are the more obvious areas of disaster and well-being in which a government is naturally involved. In addition, it should involve itself with basic technology and areas of overall technology which do not directly ally themselves with specific advantages and disadvantages such as the establishment of the traceability of measuring instruments, compilation of comprehensive technological data banks, and filling out natural science and engineering data.

In contrast, the regions which private industry should handle are probably those in which the merits of free competition necessary to comply to the various needs of the consumer come to the fore. On the other hand, there is still need for systematic comprehensive technology or basic science even in these regions, and this holds even more so for other regions. In such a case, the present type of industry where a single business conducts a comprehensive production mode will become even more difficult including the ever increasing problem of research and development costs.

To counter this situation, there is the joint development of common technology as seen in the joint development of VLSI and systematized specifications for video. The common basic technology developed by joint efforts then becomes the basis for producing products according to various needs which will become the subjects for these different industries. Another setup is the development of some large system through joint participation of industries in different lines of business similar to what is presently practiced by the Large Industrial Technology Research and Development System.

Joint research between different types of industries has been practiced in the past such as that between shipbuilding and steelmaking, but this was one involving maker and user. The independent establishment of joint development systems where assignments are made to subsystems all directed to a single large objective is certainly a very difficult undertaking, but this is one of the important directions of the future.

In this sense I am praying for the brilliant success of the VLSI development presently under way.

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NEW SYSTEM TECHNOLOGY WILL DETERMINE CHANGES IN PRODUCTION STRUCTURE--TO REINFORCE 'INTERNATIONAL NEGOTIATING STRENGTH' THROUGH INDEPENDENT TECHNOLOGY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 10-16

[Round-table discussion]

[Text] [Panelists] (in order of first response)

Toshihiro Tajima (director, the Industrial Bank of Japan)
Tokuzo Takino (director, Central Research Institute of the Electric Power Industry)
Kazuto Kenno (director, Matsushita Technical Laboratory)
Masahiro Sakamoto (principal investigator, Economics Research Institute, Economic Planning Agency)
(Chairman) Shoji Honta (director, Research Institute of Industrial Materials)

Japan's technological development for industry and business is coming to a major turning point. For example, it has been said that independent development is not possible, but this incorporates some human elements. In the midst of this situation, the survey notes of the Research Institute of Industrial Materials were used as the base for discussing future technological development with authorities from various industrial worlds.

Composite Production Will Increase

Honta: In opening this round-table discussion, I would like to present the following three points as problem subjects in order to establish points for discussion.

The first is the problem of the changes in Japan's production structure and the mode of technology development during the transition period from a system centered on oil energy to a system centered on nuclear energy.

The second is the problem of whether it is necessary to raise the level of industrial technology if Japan's future international negotiating power is to be strengthened.

The third is the problem of the rapid developments in electronics and information which are altering not only industry but the whole of society.

I hope that these three subjects will be the core around which many areas will be discussed, and I ask Mr Tajima to lead us off.

Tajima: Let me first discuss the problem of industrial environment and industrial structure from an overall viewpoint. There are many factors which bring about changes in the industrial environment, and the first item I want to bring up is the saturation of products at hand centered on durable consumer goods accompanying rise in income levels as being a problem of the ultimate demand side. At the same time, the thinking of the consumer and his desires have changed to offer a multifaceted picture. In addition, environmental problems have closed in as very severe subjects.

Along the lines of foreign economic environment, there is not only the upward cost of oil but a trend to upward rise in the cost of all resources. In another direction, the value of the yen has been fixed, and the need to adapt the industrial structure around this value has become necessary. Furthermore, emerging countries such as Korea and Taiwan have arisen as important competitors on the trade front.

On another front, advances in electronics and information processing are proceeding with great speed as was mentioned before, and technology related to energy conservation and resources conservation is advancing very rapidly.

When we look at all these factors put together, the production environment encircling Japan is expected to undergo large changes, and these changes are taking place now.

Honta: I would like to hear from the production people what they feel will be the direction these changes in environment of Japan's production structure will take.

Tajima: Basically speaking, it is likely that system type high level production will expand. When described from the past production classification, primary production which is production of base materials will see its weight decrease still further, and tertiary production will increase, and I wonder whether secondary production may not decrease somewhat. No matter what, Japan has to import $30 billion worth of oil and food, and all it has to balance this cost is secondary production.

Now the internal structure of secondary production itself will probably undergo some sudden changes. It is apparent that the weight of the machinery, electrical machinery, and precision machinery industries which are high added value, knowledge intensive industries is increasing. Construction and civil engineering related areas also are expected to expand. Furthermore, I believe that development of systems technology to cut laterally across such industries will become very active.

Development Bridging Industry and Agriculture Is Subject

Honta: Mr Tajima stated that Japan must continue to place weight on its manufacturing industry to cope with the resources problem on the international level, and I agree. Such being the case, what is the future for energy and food which are at the very root of the problem. May I ask for Mr Takino's comments.

Takino: A great many people have come forth with various opinions on their assessment of future energy aspects. Oil sources are expected to run dry in the 21st century, and we need to look to nuclear energy in its stead. I feel that most people will concur with such an outlook.

To be sure, we can look at this situation [nuclear energy] in a negative manner, and say that technology development related to energy conservation is making great headway, and energy sources other than oil or nuclear power are being developed. On the other hand, there is no recourse but nuclear energy until fusion energy becomes practical as far as a truly high density energy source is concerned. To be sure, the utilization of waste energy needs to be promoted.

Honta: What about food?

Takino: The import of food accounts for 15 percent of total imports and oil accounts for 44 percent, and the two total 60 percent. This is why the suggestion emerges that the import of food can be decreased to allow greater import of oil. In other words, the problem of just how to increase Japan's self-sufficiency in food despite the narrow land area is a major problem.

Another problem is the tie-in between energy and biologic products. For example, will it be possible to culture some type of algae and extract methane? To be sure, it should be possible to grow such plants on land, but what needs to be considered is energy development at the site where industry and agriculture paths cross. Even if we are to rely on nuclear energy as the main energy source, unless we supplement this source with other energy sources, the future energy system may undergo some troublesome times.

Now, when it comes to energy development spanning the gap between agriculture and industry, the question arises as to just who is to assume leadership. The so-called development system becomes the problem.

Transition to Biologic Technology System

Honta: While it is thought that the problem of development system will be tied in to the development of system type industries as Mr Tajima stated, I feel that this problem incorporates an important problem that is the increasing importance of the nation's role with respect to research and development. I will ask your opinions on this subject, but before I do this, let me ask Mr Kenno to describe some of the hopes of production technology for introducing electronics and information processing.

Kenno: Up to the present time, industrial technology has been pursuing mainly advantages of scale. As a result, many contradictory situations arose between industry and society. I believe that a major future subject for future technology development is just how to come out with new technology from this generation of contradictory background.

Honta: Such being the case, do you mean that development of industrial technology will also be entering an entirely new era of altogether different nature.

Kenno: That is the case. While views on prices are treated in various ways, communication technology is absolutely necessary if the safety and frictions within society are to be handled smartly. It comes to the point of how to propose some means to attain true consensus. I feel that the role of electronic and information oriented technology will become very large.

In one sense, it may be said that a new basic technology development of completely different nature will be initiated as we enter the 80's. What I refer to as basic technology here will be something that no single industry will do nor the Ministry of International Trade and Industry nor the Ministry of Agriculture and Forestry.

While nurturing the respective technologies in modular manner, it is expected that the module technology will assume comprehensive status to develop technology that provides synergistic effects, and this is expected to be a very important change.

If we consider that all this will give rise to new hardware, new materials, and new processing technology, here again one gets the feeling that we have entered an era for promoting development of need oriented technology.

On the other hand, such technology development will have some complex intertwining with society, and the rate of recovery of capital will be very slow when seen from the industrial standpoint. There is difficulty in resolving the situation unless some rather long term is considered.

Honta: Mr Kenno just mentioned the term living technology. I take that this means that technology of the past is mechanical technology, and we will be proceeding into the area of biological technology systems, and this is where the term living technology comes in.

Kenno: That is so.

International Negotiating Power Through Untrodden Technology

Honta: Mr Sakamoto is said to have come prepared on the subject "21st Century Problems," and I now ask him for his views on what Japan's situation will be from the standpoint of predicting its technological industrial structure.

Sakamoto: When we consider the situation from now to 1985, the uppermost problem as far as Japan is concerned is coordination with the foreign situation and coping with the decelerating economy. Next is the aging society problem because of the greater average age of people which should become prominent along about 1985. This will require the resolution of problems such as how to develop technology close to man as was mentioned before and how to cope with this senior citizen problem. There is the problem of how to achieve security assurance on a broad sense including the resources problem that will sustain us with respect to other countries. These are the three major problems.

Honta: Do you mean to say that there is need for technological innovation if such goals are to be attained.

Sakamoto: That is so. Unless we have a basic grasp of technology itself, there will be no negotiating power with other countries. What I term technology for such a case will require independent technology developed solely in Japan. Now, considerable period of gestation is required to produce such a technology, and there may be need to make a start as quickly as possible.

While Japan still retains strong dynamism, I feel that putting capital into forward looking areas is one way of operating. To this end, there is need for greater weight of government money. At the same time, the training of personnel will also be a major problem.

Honta: What directions will the technology to be developed take?

Sakamoto: As mentioned before, I still have strong feeling for systems technology or technology close to man. When seen from the standpoint of security assurance, there is need to challenge the so-called untrodden or virgin technologies and thereby enhance our bargaining power.

Tajima: Up till now, Japan has specialized in technology oriented developments of mass production symbolized by electronic equipment and automobiles, and it has achieved some spectacular results. Now there is need to develop technology in more virgin areas on high level technology centered on energy.

Honta: Where energy is concerned, I will ask Mr Takino whether the nation's budget is not being applied to promote a number of large-scale developmental plans.

Takino: As you well know, the Ministry of International Trade and Industry is promoting the "Sunshine Project" and the "Moonlight Project." In the area of food the Ministry of Agriculture and Forestry initiated the "Greenhouse Energy Plan" this year. These are all researches which the nation is promoting through considerable outlays of money.

Sakamoto: Another subject I have for some time stressed is the promotion of international exchange of people and culture through science and technology. In the past Japan has been known as "the country which says nothing." It was intent on absorbing from other countries and put out very little. Where information in a broad sense was concerned, Japan's "international balance" was heavily weighted toward acquisition.

On the other hand, Japan now has the power to submit some important information to the outside world where technology is concerned. This is why Japan should challenge technology which no man has as yet attempted and announce its results to the world. This should be very useful.

At the same time, interchange between people is necessary. In this respect it is important that we step forth and introduce ourselves and Japan's situation. At the same time, people from abroad should be invited and familiarized with the Japanese situation.

For example, some special research organ can be created in some spot of Japan where many foreign people can be invited. In other words, an international center for technology be created where interchange is promoted. This is a strategy I would like to see implemented in addition to security assurance.

Need for International Technology Interchange

Honta: I believe that each of you has at hand a memo "Problems Submitted From Predictions of Technology and Industry Structure 78" (see page 18). Very appropriately, many of the subjects you brought up are also found in this memo. Let us continue this discussion centered on these subjects.

Tajima: The technology problem has an aspect that should Japan push too far, it can create international friction. This is why I believe there is need to increase the depth of our international interchange. At the same time, there is need to put more of the nation's funds into large-scale virgin technology to promote such a course.

For example, we take this case at the research and development stage of nuclear power development. Roughly 4 trillion yen will be required over a 10-year period. To be sure, a fraction of this total will be borne by private sources, but any sum as large as 4 trillion yen has to be borne for the most part by the nation. If we look further at the nuclear fusion problem, this is a project which is not expected to be realized during this present century. In other words, it is a so-called virgin technology. There is even no idea what the cost will be. When we consider this type of technological development, independent development efforts are necessary, but interchange with other countries also will become necessary.

Honta: Just what degree of participation will private industry take in this development of so-called virgin technology?

Tajima: In the area of "technology close to man" that was mentioned before, we can take the example of biochemical technology in chemical technology where private industry can contribute a large part. The present recession has created a lack of research funds, and many businesses are in a passive state. I feel the need for more desire for active technological development.

Honta: I feel that what is called international interchange of technological development was something that was not even considered before the last war. I feel that this earth has developod a completely new situation. How does Mr Takino Feel?

Takino: I feel that the manner in which international interchange is conducted will differ with the country we are dealing with in affairs along the technological front. The leading countries such as the EC countries are engaging in all-out information exchanbe such as through international conferences. While Japan is geographically and culturally isolated, there is a dearth of such sites for information exchange. There is need from here on to actively promote information exchange such as through cooperation with research organs of other countries.

I feel that an understanding of the needs of the adversary country is important in interchanges with developing countries. There are many instances, depending on the particular country, in which development of agriculture must be promoted along with development of industry. Unless we are able to provide technology in response to such requests, no true interchange is realized. For example, the oil producing countries have great desire to increase their food production. On the other hand, these countries have singularly different weather, and food production in such countries will assume special status. The United States has been developing technology to produce crops even in desert areas. If one wonders whether Japan can offer such technology, the answer is it is highly doubtful. There is this type of problem.

The Nation's Role in Big Projects

Honta: I guess the time has arrived in our cooperative relationships with the future developing countries where we must consider industry and agriculture in a set form.

Takino: In addition, I believe one of the large future problems is ocean development. One example is the utilization of algae which I mentioned before. The so-called giant kelp which is a very large ocean algae will be cultivated not only as food but for industrial utilization as well. At the same time, the temperature differential of the oceans can be utilized to generate electric power. One of the phases of the Sunshine Plan has to do with the feasibility of large-scale cultivation of material such as this giant kelp. Now when this plan was initiated, it was discovered that basic research on this kelp was very scarce. The need for basic research is not limited to the industrial production area but in the biological production area as well.

As far as clean energy is concerned, just what is the total sunlight this country receives? Also, what is the seasonal variation? How much water do we have and how does it vary with the seasons? These may seem to be very basic items, yet it is the actual situation that not much is known about these factors.

In order to examine these subjects, industry must come forth with the development of instruments which match the objective at hand. These instruments are not readily forthcoming, and this is why basic surveys are proceeding sluggishly. I wonder whether here again there is need for all-out participation in technology development at the interface between industry and agriculture.

Honta: Certainly as new concepts are applied to unknown areas, there will be found a great lack of basic information in that area and undeveloped methods theory. There has been considerable mention of national projects thus far, and I would like to ask Mr Kenno to say a few words from the standpoint of secondary industries.

Kenno: There are areas of technology development which, even if left alone, private industry will take it upon itself to develop. On the other hand, technology that spans the gaps between industries or between businesses which is at the so-called systems technology level or technology development of a national level must be conducted as a matter of national policy or there is no chance. Particularly at the present time, Japanese business has been in a long state of recession and very poor profit margin as a result of which there has been very little incentive for research. In this sense who is to assume leadership for establishing big projects, and there is need for some further thoughts. This is what I feel.

Tajima: As you said, this is now a transition period, and the role of the country in filling up the troughs between technologies is very large. There are many facets which should not be left for business alone to assume.

Kenno: I was assigned for a time to one of the American think tanks where many areas of research and development were being pursued including nuclear energy. Now, all of the funds came from the national defense fund. When one talks about national defense, we all think immediately of airplanes or missiles, but the United States considers this a subject of very broad range. National defense funds are being actively spent in developments which have no direct connection with weapons.

When the Ministry of International Trade and Industry conducted the development project on NC (numerical control) production machinery, I was involved, and the budget for this project was 200 million yen. Now, the United States allotted more than 10 billion yen from its national defense fund to produce 100 NC machines in one swoop. This had a large spin-off effect and greatly altered the American machine industry.

In this manner the handling of the budget in the United States has great flexibility. One is prone to think only along the lines of weapons when national defense is mentioned, but that is not necessarily so. The use of national defense as an example may not be too appropriate for Japan, but this American line of thought needs to be adopted if we are to do anything that spans the gaps between businesses.

Honta: When one looks at the prime minister's survey on research and development funds, there is seen a decreasing weight of basic material industries as Mr Tajima mentioned. The weight of these basic material industries was large up to about 1964, and their research and development fund extended over a wide range. In one sense, it was basic research. This then gradually evolved into increasing weight of industries with clearly defined objectives such as automobiles and household electrical appliances. In other words, the areas to which funds are being allotted are being narrowed. I have an uneasy feeling that the dispersion of research and development funds seems to become more and more narrow with the changes in production structure, and I wonder how the rest of you feel.

Kenno: Taking the example of the shipbuilding companies, they have accumulated and established a splendid technology. There may possibly be some facets of this technology that might be utilized in energy development.

On the other hand, the shipbuilding industry is in a structural recession, and the technology is at a standstill. If this situation is to be remedied on a national level, the industry feels that some appealing conditions must come about. I wonder whether a research and development type industry may not be the answer. These are some of the thoughts that come to my mind.

Japan's Technologists Are "Acute"

Honta: What are Mr Sakamoto's views?

Sakamoto: While I believe the weight of the government will naturally be directed toward virgin technology, what Mr Honta mentions about aimless development which is a problem between science and technology will become evident the more previously attempted technology is handled. When such is the case, what role will the universities play? What will the relationship between universities and industries be? This I believe will be one of the problems.

It is often said that there are no good project managers. On the case of shipbuilding technology which was mentioned before, it always resolved itself into a personnel problem once it became a big project which had to be handled in comprehensive manner. How do we develop such people? This I believe to be a problem intricately tied in to Japan's vertical society.

It would seem that no matter what, the government will have to help including financial help, but the government has a number of laboratories which are split along vertical lines. When government funds for science and technology are to be increased in the future, how can a more effective utilization be attained? This, I believe will be a major problem.

Honta: I suppose this is the problem of adjusting the typically Japanese vertical society to horizontal big projects.

Sakamoto: That is so. Then where systems industries are concerned, there is the problem that much of the native sense of the Japanese has to be taken up.

For example, let us look at the problem of urbanization. Japanese housewives are sorting trash because of the trash disposal problem, and this practice greatly surprises Americans. People in New York say such a practice is inconceivable. Looking next at the geriatrics problem, the Japanese have the feeling for more families under the same roof. There seem to be moves to activate such practices when setting up systems technology.

Honta: When one mentions the Japanese, he is pointing to the considerable difference between Japanese and European technologists.

Sakamoto: When technologists from Japan are compared to those from other countries, the Japanese technologists have great depth of accumulation of knowledge in his special field, and his knowledge is very acute. The foreign technologists do not have the depth of knowledge of the field in question but poscess wide knowledge in the peripheral areas.

This is also tied in with the project manager problem which was mentioned before, but the Japanese sometimes tend to be overly acute.

Takino: I have something to say along this line. Let us assume that a certain problem develops in a developing country which Japan is aiding. The thought that arises is to send some specialist. Now, this technologist is one of those sharp characters of the type Mr Sakamoto was just talking about. There are many occasions with developing countries in which not only the problem itself but some peripheral problems as well need to be resolved. The Japanese technologist is unable to handle these peripheral problems and it becomes necessary to send anew such a specialist. This does not constitute comprehensive developmental advice. Such problems occur frequently in the agricultural area.

Sakamoto: Japan has only generalists and specialists of very narrow fields, and there are very few in-between types.

Honta: I feel sure that this is the case with Japanese technologists, but it may be said that a new type of specialist is on the verge of emerging. As was mentioned before, broadening the scope of international interchange and intentionally promoting manpower development will result in the development of sufficient technologists in the times to come.

Tajima: When we talk about international interchange, there are many kinds of bottlenecks such as language difficulties, and internationalized people are scarce. On the other hand, the younger people are much more international. I feel that we can expect this behavior of people in general in the future. More than that, what is most distressing at the present time is the recession which has continued for 4 years and the loss of incentive for technology development on the part of industry.

When Japan's GNP is computed in terms of the most recent exchange rate, it amounts to about 14 percent of that of the world. If the communist bloc and the USSR are included, it is about 10 percent, but it is 14 percent of the free world. The United States accounts for 30 percent and West Germany amounts to 10 percent. Setting the United States aside, Japan's economy has become one of giant scale. This is why even a 5 percent growth will be a tremendous growth. I believe that there is need to promote suitable technological development if a 5 percent rate of growth is to be maintained.

While it may be rather hard for a while on industry, I believe this is the time to pick up one's resolve and jump into technology development.

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PROBLEMS EXTRACTED FROM 'PREDICTIONS ON TECHNOLOGY AND INDUSTRY STRUCTURE 78'

Tokyo SHUKAN DIAMOND in Japanese Jan 78 p 13

[Article by Industrial Materials Research Institute]

[Text] 1. The following environmental and limitational needs that enfold Japan's industry and technology during the transition period between centuries are envisioned.

Area of International Politics and Economy

The transition period between centuries will be one in which the stable world setup centered on American-Soviet relations will crumble, and there will be a period of uncertainty until a new world order is established.

This will be a time of low growth and low outlay for facilities in the developed world.

This will be a time for multipolarization, diversification, and dispersal both domestically and internationally.

There will be enhanced bloc and egoistic tendencies in the world's economy.

The catchup on the part of partially emerging and developing countries will be rapid.

The cost of oil will continue to go up over the long term.

Nuclear fuel will become an international strategic weapon.

Food will become an international strategic weapon.

It will become difficult to sell ordinary products based just on price competitive strength.

Area of Domestic Society and Economy

Multiplicity and multipolarization of public opinion, values, and social awareness will increase, and assurance of effective governability will become difficult.

Urban overcrowding will not ease, and constraints on city and industrial water and siting will increase.

There will be rapid transition to an older society.

The establishment of new comparatively high class industry will take priority.

Efforts to maintain the vitality of the people and industry will take priority.

Measures toward self-sufficiency in food and self-supply of energy for the security of the economy and society will become necessary.

There will be need to establish independent technology usable throughout the world in order to insure Japan bargaining power for the next 10-20 years.

2. The following technology groups need to be developed and modified in response to the changes in domestic and foreign situations mentioned above and the newly posed problems.

The diffusion of the automation and rationalization technologies accumulated by the automobile, electronics and shipbuilding industries to related areas and peripheral areas.

Development and modification of technology related to energy conversion, improvement to utilization efficiency, effective utilization of waste energy, and effective utilization of diffuse low concentration energy which had not been utilized in the past.

Technological innovations in food production and distribution that will enable raising the self-sufficiency rate in food and international competitive edge.

Technological development and modification for modernizing and rationalizing service industries.

Technological innovation and modification for medical treatment, health, sports activities, and leisure activities of the aged and the urban class.

Development of technology system and soft technology for urban redevelopment.

3. In order to implement these various technology development subject groups:

Government and public group roles will increase to accelerating manner because many of these problems cannot be readily brought to the market mechanism just on the strength of industry or business, and many of these are tied in to the general public which is deficient in technological awareness.

The development of a modification of soft technology such as various evaluation systems to coordinate technology with society and the natural environment and for the social control system.

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SYSTEMS TECHNOLOGY PROSPECTS FOR LONG TERM STRATEGIC POLICY OF INDUSTRY--INDUSTRIAL MATERIALS RESEARCH INSTITUTE: PURPOSE AND FEATURES OF PREDICTIONS

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 20-21

[Article by Yukitoshi Nonaka, research and survey chief, and director, Industrial Materials Research Institute]

[Text] Viewpoint of Industry and Business

The Industrial Materials Research Institute is focusing its attention on production activities and is conducting an independent survey research on society economy, industry, and technology as well as their interrelationships. It publishes its "Predictions on Technological and Industrial Structures" once every 5 years. The first of these surveys came out in 1971-1972 and the second was compiled in 1976-1977 to commemorate the 15th year of the formation of this group under the direction of Chairman Toshio Doko, Yoshihiro Inayama, and Vice Chairman Takatoshi Takemata. The analytical operations were essentially ended at this stage.

Predictions on technological and industrial structures is a continuing operation of the institute. It collects information and sets up data files on 1) what domestic and foreign organizations are doing what R&D, the anticipated time of completion, and the stage of development, 2) the domestic and foreign situations with regard to the types of needs, and what technology systems are being awaited to resolve limiting conditions, and 3) which organs and structures both domestic and foreign are proposing what needs for technology development.

This data file is used as the basis for making technology predictions supplementing the data file through questionnaire surveys conducted periodically (once every 5-6 years), and the results are read with a time factor. At the same time, the data files are corrected and reinforced, and every effort is made to assemble a data source useful for providing pertinent material that can be applied to the analysis of the technology and industrial structure of Japan, medium and long term industrial and business strategy, and competitive planning.

The prediction activity of this institute is not a deeply probing affair into some specific narrow area but attempts to cover as wide a field as possible to predict the future picture of technology and industry. There is also the technology predicting activity of the Science and Technology Agency which covers roughly the same wide range and makes essentially the same predictions, and this is a service which this Agency of Science and Technology which is this country's highest government office for the administration of science and technology provides for the purpose of enhancing the people's well-being and gain through the prediction of future technology.

In contrast, the publication of the institute is based on the awareness of "almost all of the fulfillment of needs and breakthrough of limitations associated with the people's living, overall society, and industrial activity needs are made possible eventually through technology development in the various industrial areas and business efforts." Industry tries to determine just how to grasp these needs, establish what items and what structures should be developed for the post-80 period industrial structures, and just how these will exist.

Assuming that the technological predictions of the Science and Technology Agency is a future atlas that gives the Japanese and world picture on a 5 million to one to 100 million to one scale, the predictions of the institute will cover the same area at a 500,000 to one to 200,000 to one scale.

To be sure, these two predictions have their own features and are mutually complementing, but it may be said that the institute's survey is better suited for the individual firms.

Three Panels

The program for the predictions of production and technology structures set up three panels. The first panel consisted of 239 from the top companies, prefectural officers, and public policy corporations [Tokushu Hojin] people from whom responses were obtained relating to the macro environment, needs, and limitations enveloping Japan's industry in the post-80 era. The second panel was further subdivided into the living, society, and industry subpanels. These subpanels elicited information from 287 people who headed various planning, development, and administrative groups. They gathered information on the type of system technology required to break through certain barriers, and when such systems will be required. The third panel included 12 special subpanels. These solicited information from 345 people representing the first line of leaders of various research organs and national and public research organs on when what seeds (seeds for technology, nuclei) should be used.

Man is the only living creature who can use technology to mimic the natural and create artificial means for people to exist and develop. He violates the rules of ecology to increase his numbers. The degree of these reversal and enhanced separation processes increased suddenly from after the start of the industrial revolution and has been enhanced in the 20th century by the tight bond between science and technology. The acceleration has increased all over the world since World War II, and the most recent awareness of the finite nature of resources and the limitations of overdensified society have drawn attention to the threat man faces. The fourth quarter of the 20th century will probably be the historic and planned period when man will confront this menace.

This menace is appearing in the form of systematically high prices of resource products including energy, increasing difficulty in obtaining resource products, instability in food supply, and worsening living environment including homes and traffic. These manifestations of the situation are varied, and people of all levels of good and bad relationships from both at home and abroad are contributing to the situation through complex claims to authority and veto rights. The technological countermeasures that need to be developed in order to fulfill these needs in compliance to the situation, break down the limitations, and promote smooth living, social, and production activities are no longer the simple situation that the mere development of some special technology will resolve.

Predictions in 12 Areas

These technological countermeasures are overwhelmingly composites of multiple individual technologies and component technologies which have been synthesized and systematized to become so-called systems technology and systematized technology. Japan's industry developed new system technology in order to break through the various difficulties unique to Japan and is establishing and improving itself. At the same time, there has been the opportunity to contribute to the welfare of the entire world through high and long term cost performance of the most advanced country as the result of counter efforts against overcrowding limitations and resources limitations.

These system technologies may become the desirable technology and product export goals for Japan which is poor in resources and which is strictly a manufactures trade country.

What will now be introduced will be the data provided by the second panel almost in their entirety and a portion of the systems technology compiled by the third panel (total of 506) arranged according to 12 categories which are expected to become urgent in the future. These are energy, food, resources, industrial production, information and communication, environmental protection, cities, disasters, medical treatment-well being, international interchange and trade, education-culture-leisure, and household activities and household finances.

Now, when will these 12 categories possibly be utilized in form of system technology, what will be the intensities that can be anticipated, and what in the way of conditions which promote, accelerate, or control their appearance can be expected? The kind of components and technology (materials and parts, components, machinery, buildings, services, etc.) necessary to the materialization of these system technologies have been indicated. In addition, the probability that a given system technology will emerge in the midst of all these concepts has been indicated along with information useful for setting up long-term plans.

In addition, each category is provided with a general summary and the results of questionnaires circulated for the purpose. The authors of the summaries are research members of the Industrial Materials Research Institute, and the figures given in the questionnaire results are the number of people who responded.

2267
CSO: 8129/1906

ESTABLISHMENT OF INDEPENDENT NUCLEAR FUEL CYCLE TO SERVE AS MAINSTAY ENERGY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 22-37

[Article by Motohide Nishio]

[Text] Price of Oil Will Rise Steadily

When one looks at the next 30 years into the first part of the next century, just what will be the energy demand and supply structure to fulfill the Japanese people's living requirements and Japan's industrial production? There are possibilities of short-term oil oversupply and weakness in price, but there is no doubt that the long-term picture will be one of steadily increasing price.

Japan presently consumes more than 10 percent of the oil produced in the world while the United States consumes 30 percent, and these two countries account for 40 percent of the world's consumption. Unlike the United States which has vast reserves of oil, coal, oil shale, and natural gas and the Western European countries such as the United Kingdom, Holland, and Norway (the United Kingdom and France also have some domestic sources) which have very recently entered the ranks of oil producing countries as the result of the discovery of vast oil and gas resources in the North Sea, Japan must import 99 percent of the oil it uses. At the same time, there is an extreme dependence on oil to provide close to 80 percent of the energy consumed emphasizing this oil dependent and foreign resource dependent structure, and one wonders how long this energy demand structure can last.

Now, should a country such as ours with abundant foreign funds along with other leading countries keep buying oil in accelerated manner to improve their people's living and their levels, the price of oil will go up, making it difficult for countries that are partly developed or just beginning to develop to purchase oil.

Now, should we import just the oil we need to practice what we should do in the future, there will be concern for severe inflation. The energy problem is one which no one country can consider separately. Even when a country's future energy demand situation is being considered, the study has to be made in line with the total energy balance of the world.

Increasing Private Power Demand

The oil consumption of the leading countries is replete with factors associated with an increasing trend, and there are no factors favoring decrease.

First of all, if we are to decrease environmental pollution and make pleasant and convenient daily living activities such as traffic, energy consumption naturally will increase.

For example, if Japan were to get away from the use of fuel oil, remove sulfur from gas, remove sulfur from smoke, and lower sulfur compounds in oil to suitable levels, the effort is said to require about 10 percent of its oil consumption. In addition, it is said that the removal of nitrogen oxides will be another major problem. The transport of oil from overseas sources to Japan also is said to require 10 percent of the total oil consumption.

Furthermore, a certain level of economic growth is necessary if a suitable living standard is to be promoted. It is possible on a long-range plan to bring the production structure to a high level and lower the basic energy unit, but increase in energy consumption cannot be avoided in the short and medium time periods. At the same time, the urbanization phenomenon which is affecting both developing and advanced countries alike is associated with increased energy consumption.

There are also the high class type of energy consumed accompanying advances in civilization and culture. That is to say, the fraction of electrical energy used will increase in an unavoidable trend among all the final forms of energy usable.

These are accompanied by increased consumption of primary energy, and the primary energy sources of Japan have to be oil, natural gas, or nuclear power in a country with limited hydropower. Among the leading countries, Japan has the lowest rate of total energy consumption by the consumer sector, and industry's share is high, but it is expected that the fraction used by the consumer sector will increase from here on.

Very recently there has been the proliferation of high rise apartments which heat and cool entirely with electricity providing the energy and completely bypass the use of oil or gas in order to prevent accidents and disasters. The use of room coolers during the summer is now considered a must situation for improving the quality of life in Japan which is a high temperature and high humidity country, and this use is expected to increase even more in the future.

Up to about 10 years ago, the peak electric power consumption in Japan occurred in the winter, but it is now widely known that this peak load has shifted to the summer, and it is probably the case that the popular use of consumer electrical appliances and various developments will result in sharp increases in home power consumption.

The steel industry, chemical industry, and electric power industry which are the big consumers of primary energy in Japan are incorporating energy conservation measures one after another and are already some of the better energy conservers in the world. It is expected that there will be major expansions in tertiary industries hereafter replacing the secondary industries, and travel, dining out, and leisure are expected to expand more and more. The use of high class energy such as electric power, oil, and gas is expected to increase sharply.

In line with the environmental pollution problem, the electric automobile is expected to find popular use in the metropolitan areas, but this mode of transportation uses electricity which is an even higher class of energy than gasoline or LPG. This is why it is expected to operate in a direction to increase primary energy consumption.

Demand of Developing Countries Will Also Increase

It is expected that the energy consumption of developing countries and partially developed countries will also increase in the future along with their industrialization and urbanization. Even a slight increase in living standards of these developing and partially developed countries which make up an overwhelmingly large fraction of the world's population will accelerate the use of energy required to produce consumer goods and capital goods and the energy incorporated in plastics, steel, aluminum, and synthetic fibers along with the energy required to operate automobiles and private electrical equipment. The use of room coolers may also proliferate in extreme cases.

The increased energy consumption for food production cannot be ignored. At the present time, there is a precarious balance between the world's food production and its vast population, and a large fraction of the world's population is in a state of chronic malnutrition.

The agriculture of countries with capacity to produce excess food to counter such a situation and of leading countries with food self-sufficiency is high energy consuming agriculture that resorts to chemical fertilizers, agricultural chemicals, production and operation of agricultural machinery, and transportation all of which consume energy. The production of rice and allied products in Japan is through the investment of much greater energy than what is recovered in the crop. A long time will be required to go back to agriculture which relies on natural (sunlight) energy, and this will not happen for some time (several dozen years to several hundred years).

In another direction, much of the oil resources is enmeshed in an economic environment in which new discoveries of oil resources of low prospecting and drilling costs are gradually diminishing, and their production is not keeping up with increased consumption. As a result, the world's oil reserves are steadily decreasing. This is why the major oil producing countries are planning to retain their resources to the stage that some reliable economic basis is established after industrialization has ended and are already studying reservation plans for oil resources which are expected to be implemented shortly.

In this manner, the oil demand, while seeing some short term exceptions, will soon curve sharply upwards, increase in cost, and become unstable in supply.

Rehabilitation of Coal

Such being the situation, what measures must Japan take and what is there for it to do?

In the deployment of the developmental subject groups for this prediction study, we considered the three countermeasure groups of base energy, substitute energy, and conservation energy. If the large scale and complex industry and people's living habits of today are to be maintained in smooth manner, both the energy user and supplier with the help of several years background will require large quantities of supplyable energy in stable and concentrated form. This is what is referred to as base energy.

It will be oil or nuclear energy that will provide this base energy for the present and the near future. Everyone is aware how oil has worked its way to become the foundation of the production activities and urban life that are characteristic of modern society. There is, however, a large shadow looming in the future. Nuclear energy emerged as the successor to oil. While it cannot be said that nuclear energy has adequately matured and been refined, it is a form of energy that is capable of concentrated and integrated production and consumption which can play a key role in countries such as Japan and some European countries which do not possess abundant oil and coal resources as base energy.

We next look at substitute energy. This is energy which in part can be utilized in place of base energy. Should technological refinement and maturity set in, it has the potential of changing to base energy in the distant future. Coal, oil shale, tar sand, solar energy, wind power, biomass (utilization of plant energy), and geothermal energy come to mind here. Coal is known to be present in far greater reserve than oil but it suffers in comparison to oil where production, transportation, and consumption efficiencies are concerned as well as its concentrated and integrated application as a result of which large scale and integrated industrial activities are not realizable. This is why it relinquished its role as base energy source to oil years ago. On the other hand, it possesses the capability that it may occupy a corner of the base energy picture once more through some technological innovations.

At the same time, oil shale and tar sand contain greater reserves than oil if just the hydrocarbon content is concerned, but the distillation or dry-distillation technology to extract the oil is still at the infant stage. Unless there is some large increase in the price of oil in the future which will put into action external factors to stimulate development, their development is not expected to be spectacular. On the other hand, the technology must be promoted.

The next item is energy conservation. If it were possible to slightly increase energy use efficiency in industrial activities and urban living, there will be that much decrease in depletion of energy resources, and there will be economic and spin-off effects to environmental problems, transportation problems, and other vast problems. This is why planning energy conservation from both the technology and system angles is equivalent to the discovery of new energy resources, and this will have an impact on the economic environment that will not take a back seat to other developments.

Recovery of Uranium in Sea Water

Japan is presently taking all means to increase its base energy situation and is increasing its oil accumulation to be able to cope with extraordinary events. At the same time, it is planning diversification of oil and gas sources through development of areas such as the north polar region. Prospecting and developing of oil and gas sources on the continental shelf of the seas around Japan are under way in efforts to enhance Japan's bargaining power. It is also promoting independent light water reactor technology while also bringing into a practical stage the fast breeder reactor and the high temperature gas reactor to open the way for the utilization of nuclear power to industrial activities other than power production. An independent Japanese nuclear fuel cycle needs to be established to break away from the "toiletless mansion" status and there has to be large increase in effective and economic utilization of uranium.

On a long term basis the establishment of technology to recover uranium from sea water is also necessary. In view of the sure situation that uranium will follow oil as the strategic item of international trade, the establishment of the nuclear fuel cycle and the recovery of soluble components (uranium, lithium, thorium, etc.) from sea water are expected to play major roles in the future.

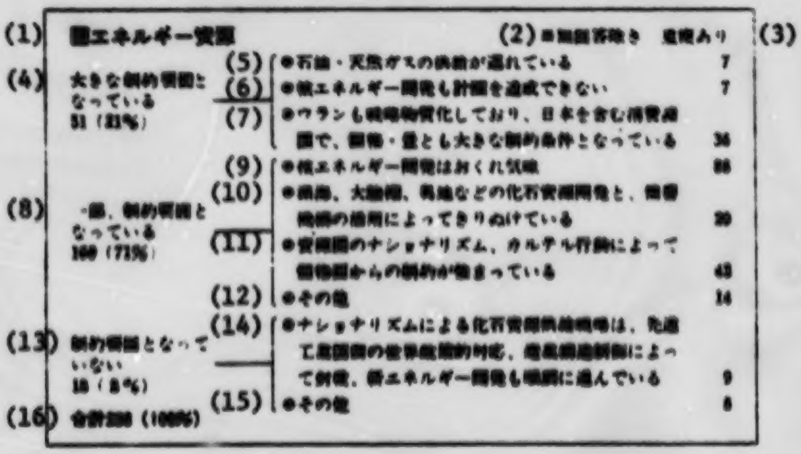
Electric power which is a high level secondary energy is being used more and more by industry and the people, yet the siting of power plants is facing difficulties from public resistance movements. This is why technological development to site power plants at remote sites from which power is transmitted to consuming areas will become an important subject.

The first important item under substitute energy is the early technological development to rehabilitate coal. This involves the liquefaction and gasification of coal at a price competitive with oil (at a future date when the price of oil has gone up much more) in readily concentrated and integrated form through the development of the proper technology. This is an urgent problem.

Next in line as far as desirable developments go is the technology on tar sand and oil shale development which involves recovery of oil from vast reserves which offer greater impediments to recovery compared to oil through joint research and development with countries possessing such reserves. Geothermal energy and particularly solar energy are dispersive sources of energy which are expected to play major roles in areas where high concentration of energy is not required such as in forests, fields and at sea. Wavepower, wind power, tidal flow, tidal ebb, and ocean water temperature differential and similar natural energy source will be very difficult to utilize economically because of their singular nature, however they may play substantial roles in certain special regions or industrial applications.

One source which must not be overlooked as far as substitute energy is concerned is hydrogen. At the present time hydrogen is obtained by the decomposition of hydrocarbons which makes it a very expensive item. If hydrogen can be produced cheaply in the future through solar energy, the high temperature of the nuclear reactor, or thermochemical method, it can be used in a manner similar to gasoline and LPG. It will have the status of secondary energy just as electric power and is expected to play the same large role.

There are no past examples of technology related to energy conservation, but methods to recover and use medium and low level waste heat which had been discarded in the past and development and application of methods to utilize heat from high temperature region to low temperature region through a cascade system (several facilities used in continuous manner) come to mind. The development to the practical stage of system to effectively utilize new type of low temperature energy such as the cold temperature of LNG, development of machinery, and using excess sludge from sewers, agricultural wastes, and accumulated wastes organic material to produce gaseous fuels by methane fermentation for heat and electric power generation need to be hastened.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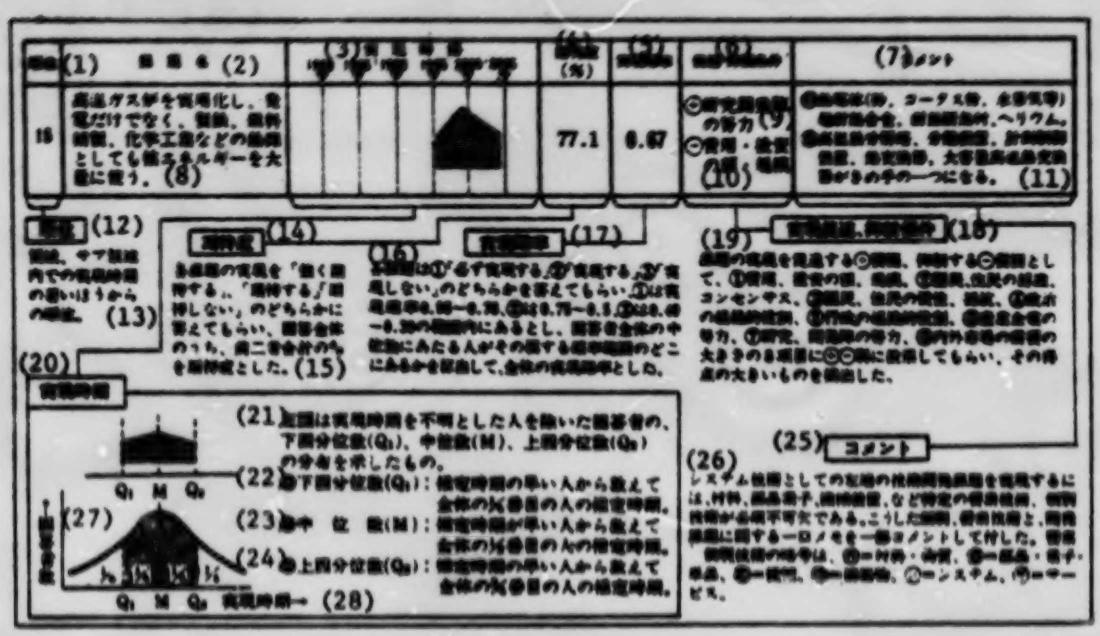
Key:

1. Energy resources
2. Excluding non response
3. Repetitions found
4. Are a major restrictive factor
5. Supplies of oil and natural gas are delayed
6. Nuclear energy development will not go according to plan
7. Uranium is also a strategic material, and both price and volume will become large restrictive conditions in consumer countries including Japan
8. Are a partial restrictive factor
9. Feel that nuclear energy is delayed
10. Has come to the fore through fossil resources development of deep seas, continental shelf, and remote lands and activities of storage mechanisms
11. Nationalism of countries with resources and cartel actions which increase price restrictions
12. Other
13. Do not constitute a restrictive factor
14. The fossil resources supply strategy due to nationalism is being countered by worldwide policies of the leading industrial countries and forced out by industrial structure control, and new energy development is proceeding smoothly
15. Other
16. Total 238 (100%)

Explanation of Tables on Following Pages [Sample]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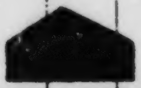
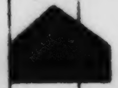
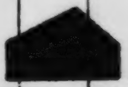
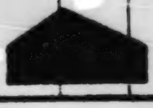
Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting/limiting conditions
7. Comments
8. The high temperature gas reactor will be made practical and used not only for power generation but as heat source for steelmaking, fuel refining, and chemical industry to use nuclear energy in large quantity
9. Research and development establishment efforts
10. Cost, capital investment, scale
11. (M) thermal medium (sand, coke powder, water vapor, etc.) super heat resistant alloy, heat resistant thermal insulation helium.
    (E) high temperature cracking tower, decomposition facility, measurement and control equipment, heat exchanger. The large capacity heat exchanger will be one of the limiting factors
12. No.
13. Ranked from the later materialization time within group or subgroup
14. Desirability
15. Answers were solicited on the materialization of each subject according to "greatly desired," "desired," and "not desired." The sum of the first two expressed in percent was the degree of desirability.

[Key continued on following page]

16. Answers were solicited on each subject according to 1) "will certainly materialize," 2) "will materialize," and 3) "will not materialize." It was assumed that 1) came in the range of 0.95-0.76 probability, 2) in the 0.75-0.5 range of probability, and 3) in the 0.49-0.30 range of probability. The position of the median response was taken as the materialization probability of the sample.
17. Probability of materialization
18. Factors favoring or impeding materialization
19. (+) identifies factors promoting materialization and (-) identifies factors impeding. The 8 items of 1) cost, investment, scale, 2) awareness, consensus of people and residents, 3) inertia, resistance of people, 4) political organizational role, 5) organizational role of administration, 6) efforts of industry and firms, 7) efforts of research and development establishment, and 8) magnitude of foreign and domestic market demands were evaluated by counting responses and major items listed.
20. Materialization period
21. The figure on the left is a distribution of the responders excluding the people who indicated uncertain time including the lower quartile (Q_1), median (M), and upper quartile (Q_2)
22. Lower quartile number (Q_1): the time of materialization estimated by the persons whose estimate was the latest of the 25 percent of respondents who predicted earliest materialization
23. Median number (M): the time of materialization estimated by the person whose estimate was the latest of the 50 percent of respondents predicting earliest materialization
24. Upper quartile (Q_2): the time of materialization estimated by the person whose estimate was the latest of the 75 percent of respondents predicting earliest materialization
25. Comments
26. Specific factor technologies and individual technologies for materials, components, equipment, and such are indispensable to the materialization of technological development subjects listed at the left as system technologies. These individual and factor technologies and notes on development subjects are listed as comments. The abbreviations on individual technologies are (M) = materials, (C) = components, elements, units, (E) = equipment, (B) = buildings, structures, (Sys) = system, (Ser) = service
27. Number of responding people
28. Materialization period

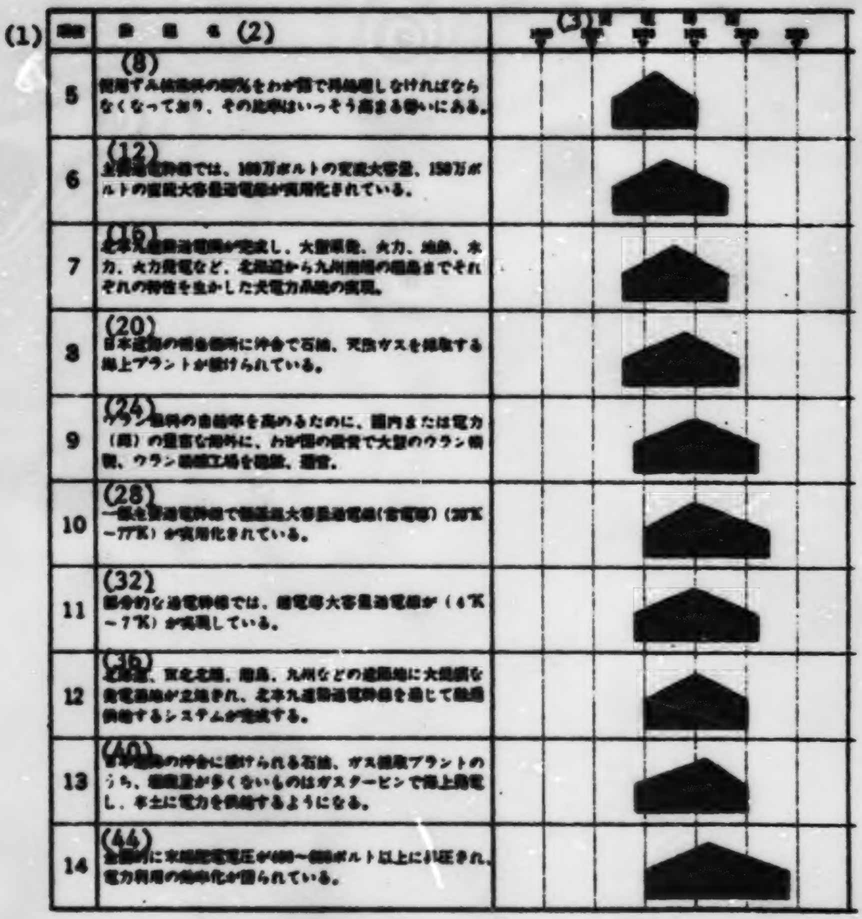
(1) 順位	課題名 (2)	(3) 実現時期 1980 1985 1990 1995 2000 2005
	(8) **基幹エネルギー**	
1	(9) LNGが重要な貿易商品となり、多数のLNGタンカーが就航している。	
2	(13) カナダ北部、アラスカなど高緯度地帯の豊富な天然ガス、石油などの開発が進み、わが国への有力な供給基地になる。	
3	(17) 重油専焼バーナーがそのまま使えるコロイド化微粉炭の重油混焼方式の普及。	
4	(21) 発電用軽水炉の構造、部品、機械、施工法の標準化が徹底的におしすすめられ、建設費と発電コストの抑制、引下げを可能にする。	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comment
8. Basic energy
9. LNG becomes important trade item, and a number of LNG tankers will ply the seas
10. (+) size of demand in domestic and foreign markets
11. (-) costs, investment, scale
12. (M) low temperature resistant steel, low temperature resistant aluminum alloys, low temperature insulating materials.
    (C) LNG tanks, LNG valves, LNG pipes.
    (E) gas recovery equipment, gas turbine for ship use, LNG pump.
    The Japanese shipbuilding has yielded superiority in building oil tankers to partially developed countries and now is persevering with LNG tankers
13. Development of abundant natural gas and oil resources will take place in the high latitude areas of Canada and Alaska and become powerful supply bases for Japan
14. (+) political organizational role
15. (-) costs, investment, scale
16. (M) low temperature resistant steel for pipeline use, insulating material.
    (Sys) security system
    (C) line pipe
    (E) gas turbine, pump, instrumentation systems, ice breaking tankers
    (Scini)-submarine ice breaking tanker

(4) 重要度 (%)	(5) 実現確率	(6) 促進・抑制条件	コ　　メ　　ン　　ト (7)
87.8	0.77	⊕内外市場での需要の大きさ (10) ⊖費用・投資の額・大きさ (11)	(12) Ⓜ耐低温鋼、耐低温アルミ合金、低温断熱材。ⒺLNG タンク、LNG 用バルブ、LNG 用パイプ。Ⓔ気化ガス回収装置、舶用ガスタービン、LNG ポンプ。日本造船業はオイルタンカーは中進国に譲り、LNG タンカーで頑張っている。
90.0	0.77	(14) ⊕政治の組織的役割 ⊖費用・投資の額・規模 (15)	(16) Ⓜパイプライン用耐低温鋼、断熱材。㋛管制システム。Ⓔラインパイプ。Ⓔガスタービン、ポンプ、計測システム、砕氷タンカー、（半）潜水砕氷タンカー。
87.8	0.73	(18) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (19)	(20) Ⓜ乳化用界面活性剤。Ⓔ石炭微粉砕機、混合乳化機。電源開発（株）が大規模実験進めている。
85.7	0.73	(22) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (23)	(24) ㋛原子炉の構造標準化システム、原子炉部品・機械の標準化システム、原子炉建設施工法の標準化システム。

17. Popular use of special fuel oil burners for mixed fuel oil-colloidal coal powder combustion
18. (+) efforts of industry and firms
19. (-) costs, investment, scale
20. (M) surfactants for emulsification
    (E) coal pulverizer, mix emulsifier. Electric Power Development Co. is promoting large scale project
21. Standardization of structure, parts, machinery, and operating methods of power generation light water reactors is given all-out encouragement enabling control and reduction of construction costs and power generation cost
22. (+) efforts of industry and firms
23. (-) costs, investment, scale
24. (Sys) structural standardization system for nuclear reactors, nuclear reactor parts, and machinery standardizing systems, and standardizing system for methods of constructing nuclear power facilities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12 (36)
13 (40)
14 (44)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comments
8. At least 50 percent of spent nuclear fuel will have to be reprocessed in Japan, and this ratio is in an increasing trend
9. (+) research and development establishment efforts
10. (-) costs, investment, scale
11. (M) nitric acid, fluorine, bromine
    (E) fluorination fluidized bed, reaction tower, FP impurity separation facility, manipulator, robot, powder nuclear fuel forming machine.
    (Sys) FP impurity storage system. There must be disengagement from so-called "toiletless mansion" situation of the Japanese nuclear power industry
12. Million volt high power AC transmission on trunk transmission lines and 1.5 million volt DC transmission become practical
13. (+) industry and firm efforts
14. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]・[illegible]	コ　メ　ン　ト (7)
75.5	0.71	(9) ⊕[illegible] ⊖[illegible] (10)	(11) [illegible]「トイレなきマンション」[illegible]
93.8	0.74	(13) ⊕[illegible] ⊖[illegible] (14)	(15) [illegible]
84.0	0.70	(17) ⊕[illegible] ⊖[illegible] (18)	[illegible] (19)
76.6	0.68	(21) ⊕[illegible] ⊖[illegible] (22)	[illegible] (23)
84.0	0.68	(25) ⊕[illegible] ⊖[illegible] (26)	[illegible] (27)
75.6	0.69	(29) ⊕[illegible] ⊖[illegible] (30)	(31) [illegible]
84.1	0.69	(33) ⊕[illegible] ⊖[illegible] (34)	(35) [illegible]
80.9	0.71	(37) ⊕[illegible] ⊖[illegible] (38)	[illegible] (39)
70.5	0.70	(41) ⊕[illegible] ⊖[illegible] (42)	[illegible] (43)
40.4	0.37	(45) ⊕[illegible] ⊖[illegible] (46)	(47) [illegible]

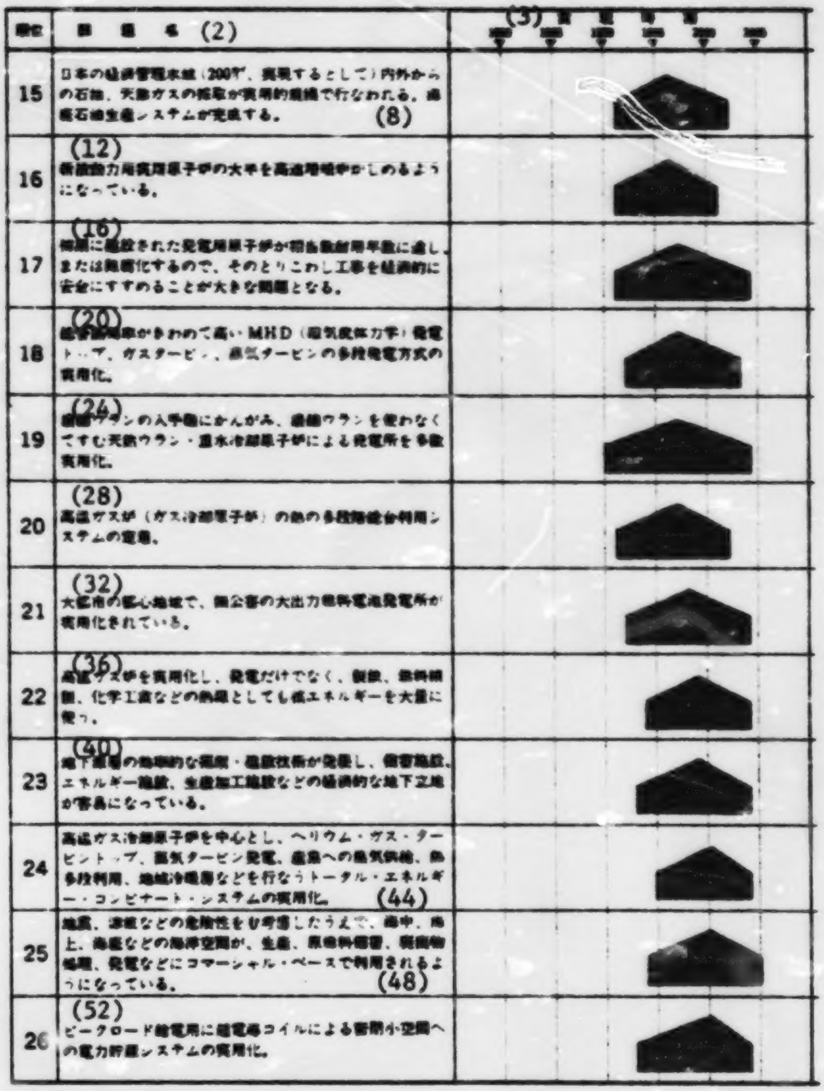
15. (M) weather resistant high tensile steel (for transmission towers)
    (E) large capacity transformer, lightning arrestor, computer, power grid control system
    (C) super high voltage AC cable, super high voltage DC cable, super high voltage insulator (ceramic and plastic), conduits for buried cables
    (B) transmission tower
16. The Hokkaido-Honshu-Kyushu transmission network will be completed to enable distribution of power from large nuclear reactors, thermal, geothermal, and hydropower generators from Hokkaido to the lesser islands off Kyushu
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) weather resistant high tensile strength steel (for transmission tower use)
    (E) large capacity transformer, lightning arrestor, computer, power grid control system
    (C) super high voltage AC cable, super high voltage DC cable, super high voltage insulators (ceramic and plastic), underseas transmission cable
    (B) transmission tower.
    3,000 km transmission system to tie the Japanese archipelago into a single transmission system

[Key continued on following page]

20. Construction of offshore plants to extract oil and natural gas from the seas near Japan
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (M) sea water resistant steel, sea water resistant concrete, sea water resistant mortar
(Ser) prospecting operation, mining operation, rig leasing
(C) seamless steel pipe, pipe, valves
(B) offshore work ship (rig), pump, drilling rig (turbo drill, etc.)
24. Construction and operation of large uranium refinery and uranium enrichment plant with Japanese capital in Japan or in an abundant electric power country in order to increase uranium fuel self-sufficiency
25. (+) political organizational role
26. (-) costs, investment, scale
27. (M) carbon fiber reinforced plastic, superduralumin, fluorinated resin membrane
(E) ultracentrifuge, computer, instrumentation and control system, vacuum pump, CO_2 laser, simultaneous preparation facility using computer. Overseas siting will depend greatly on the foreign situation (particularly the attitudes of the United States and the USSR)
28. A portion of the trunk transmission lines will be operated by very low temperature (20° to 77° K) large capacity transmission lines
29. (+) research and development establishment efforts
30. (-) costs, investment, scale
31. (M) liquid hydrogen, liquid nitrogen, super low temperature insulating material
(C) super high voltage cable, liquid hydrogen (or nitrogen) transmission pipe
(E) super low temperature pump
32. Superconductive (4°-7° K) high capacity power transmission will be used in a portion of the trunk transmission lines
33. (+) industry and firm efforts
34. (-) costs, investment, scale
35. (M) liquid helium, super low temperature insulator (such as inorganic fiber + aluminum foil, etc.)
(E) super low temperature pump, helium liquefier, transformer
(C) superconducting cable, liquid helium transport pipe
(B) underground cable route
36. Large power generation bases will be established in Hokkaido, extreme northern Tohoku district, and Kyushu, and a transmission system tying together Hokkaido, Honshu, and Kyushu will be completed
37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (M) liquid nitrogen, liquid helium
(C) super high voltage DC transmission cable, super high voltage AC transmission cable, super low temperature transmission cable
(E) super low temperature pump, nitrogen and helium liquefaction units, computer, automatic power control system. Power generated in unmanned sites will be transmitted to large cities

[Key continued on following page]

40. Those oil and gas plants in the seas off Japan with small reserves will be used to operate on-sea gas turbines to generate power to be transmitted to the mainland
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) sea water resistant steel, sea water resistant concrete, sea water resistant mortar
(C) seamless steel pipe, valves, underseas transmission cable
(E) large gas turbine generator, offshore work ship (rig), tank. Being studied at the oil and gas fields of Hokkaido. Advantageous for use with small scale oil and gas wells for their activation
44. Electric power voltage will be jacked up to 400-600 V in final distribution to enable more efficient utilization of power countrywide
45. (+) organizational role of administration
46. (-) costs, investment, scale
47. (C) electric cables
(E) transformer
(Sys) long term plan for higher voltage operations.
Transmission losses are reduced, and the economic effect will become very large.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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comments
8. Recovery of oil and natural gas can be conducted on practical scale from within and without Japan's sea control area (200 nautical miles if enforced). Perfected underseas oil production system
9. (+) industry and firm efforts
10. (-) costs, investment, scale

[illegible] (%) (4)	[illegible] (5)	[illegible]・[illegible]条件 (6)	コ メ ン ト (7)
80.0	0.68	(9) ⊕[illegible]・企業の努力 ⊖需用・投資の額・規模 (10)	Ⓜ耐海水鋼、耐海水性コンクリート、耐海水性モルタル。[illegible]、[illegible]、リグ・リーシング。[illegible]鋼管、鋼管、バルブ。[illegible]（リグ）、ポンプ、[illegible]（ターボドリルなど）。[illegible]が大型プロジェクトで研究開発中。 (11)
91.3	0.74	(13) ⊕[illegible]・企業の努力 ⊖国民・住民の慣性・抵抗 (14)	Ⓜプルトニウム燃料、トリウム燃料、原子力関係各種レアアースメタル、液体金属（ナトリウムなど、冷却剤）、耐熱合金。[illegible]、熱交換器、コンピュータ、計測制御装置。[illegible]、いわゆる「夢の原子炉」だが、[illegible]（とくに米国の動向）が[illegible]。 (15)
80.9	0.73	(17) ⊕行政の[illegible]役割 ⊖需用・投資の額・規模 (18)	Ⓜ放射線しゃへい材料。[illegible]しゃへい構造物。[illegible]しゃへいコンテナ。[illegible]大出力ロボット、大出力マニピュレータ、ITV システム、大出力レーザーカッター、ロボット・クレーン、計測ロボット。[illegible]ロボットが大きな役割を果たすことになるかも。 (19)
89.1	0.70	(21) ⊕研究開発[illegible]の努力 ⊖需用・投資の額・規模 (22)	Ⓜ[illegible]化シート[illegible]（[illegible]など）、[illegible]（セラミックス系）、[illegible]断熱材、耐熱合金。[illegible]、[illegible]、コンピュータ、計測制御装置、熱交換器、蒸気発生器（ボイラ）、ガスタービン、インバータ、蒸気タービン。 (23)
70.8	0.66	(25) ⊕[illegible]・企業の努力 ⊖需用・投資の額・規模 (26)	Ⓜ重水、天然ウラン燃料。[illegible]圧力容器。[illegible]天然ウラン燃料素子。⊖システム計画・設計・試作、[illegible]。[illegible]原子炉。CANDU 炉（加）、ATR（[illegible]）が有力な[illegible]。 (27)
87.0	0.70	(29) ⊕[illegible]・企業の努力 ⊖需用・投資の額・規模 (30)	(31) Ⓜヘリウム、耐熱合金、耐熱断熱材、断熱材。[illegible]ヒートパイプ、パイプ。[illegible]ヘリウム・ガス・タービン、熱交換器、ヒートポンプ。
73.3	0.66	(33) ⊕研究開発[illegible]の努力 ⊖需用・投資の額・規模 (34)	Ⓜ[illegible]、[illegible]、[illegible]、[illegible]材料。⊖[illegible]の見直し。[illegible]大型電池[illegible]、パイプ、[illegible]装置、ポンプ、インバータ、変圧器。[illegible]は水なので[illegible]公害。[illegible]ガスがあればよく、[illegible]も高い。 (35)
77.1	0.67	(37) ⊕研究開発[illegible]の努力 ⊖需用・投資の額・規模 (38)	(39) [illegible]、耐熱合金、耐熱断熱材、原子力関係各種レアアースメタル、ヘリウム。[illegible]分離膜、タンク、コンピュータ、計測制御装置、熱交換器、ポンプ、高温ガス原子炉。原子炉を中心にする総合コンビナートが成立する。
68.1	0.61	(41) ⊕行政の[illegible]役割 ⊖需用・投資の額・規模 (42)	Ⓜ高[illegible]コンクリート、[illegible]化剤。[illegible]石油・ガス地下[illegible]、地下火力発電所、地下原子力発電所。[illegible]パイプ、[illegible]パイル。⊖[illegible]計画・設計、TA、エンジニアリング。[illegible]、[illegible]。 (43)
83.3	0.68	(45) ⊕[illegible]・企業の努力 ⊖需用・投資の額・規模 (46)	[illegible]耐熱合金、ヘリウム、原子炉関係各種レアアースメタル、[illegible]断熱材、断熱材、[illegible]。[illegible]パイプ、バルブ。⊖システム計画・設計、エンジニアリング。[illegible]熱交換器、ヘリウム・ガス・タービン、蒸気発生器、ボイラ、[illegible]、コンピュータ、計測制御システム。 (47)
75.7	0.67	(49) ⊕[illegible]・企業の努力 ⊖需用・投資の額・規模 (50)	Ⓜ耐海水性鋼、耐海水性コンクリート、FRP、[illegible]。[illegible]海洋土木工事、海洋[illegible]工事、[illegible]システム。[illegible]耐海水性パイル、大型 FRP 構造部材。⊖フィージビリティ・スタディ。[illegible]作業台船、海中[illegible]、潜水作業船。⊖TA、環境アセスメント。[illegible]海洋開発の重要な部門。 (51)
82.1	0.67	(53) ⊕研究開発[illegible]の努力 ⊖需用・投資の額・規模 (54)	Ⓜ[illegible]、ヘリウム、[illegible]断熱材、[illegible]。[illegible]ケーブル、パイプ。[illegible]磁石・コイル、インバータ、スイッチング[illegible]、サイリスタ、ヘリウム液化機。[illegible]エネルギー[illegible]で研究をはじめた。大型[illegible]より[illegible]となる公算大。 (55)

11. (M) sea water resistant steel, sea water resistant concrete, sea water resistant mortar
    (Ser) ore prospecting, ore recovery, rig leasing
    (C) seamless steel pipe, steel pipe, valves
    (E) offshore work ship (rig), pumps drilling rig (turbo drill, etc.). Under study as large project of Ministry of International Trade and Industry
12. Fast breeder reactor will account for the greater part of the newly installed practical nuclear reactors
13. (+) industry and firm efforts
14. (-) inertia and resistance of public

[Key continued on following page]

15. (M) plutonium fuel, thorium fuel, nuclear power related rare earth metals, liquid metals (such as Na for cooling), super heat resistant alloys
(E) various types of fast breeder reactors, heat exchangers, computers, instrumentation and control equipment
(Ser) personnel training. This is the so-called "dream reactor" but international environment (particularly movements in the United States) is problem
16. A considerable number of the initially installed reactors will be coming to the end of their days or deteriorate, and their safe dismantling will become a major problem
17. (+) organizational role of administration
18. (-) costs, investment, scale
19. (M) temporary shielding
(B) temporary shield structure
(C) radiation shielded container
(E) large output robot, large output manipulator, ITV system, large output laser cutter, robot crane, measurement robot. Possibility that robots will play major role in breakdown operations
20. Practical development of MHD (magnetohydrodynamic) power generation top gas turbine, and steam turbine multiple stage power generation of very high overall efficiency
21. (+) research and development establishment efforts
22. (-) costs, investment, scale
23. (M) ionization seed material (such as potassium), super high temperature electrode (ceramic system), super high temperature thermal insulation, super high temperature alloys
(E) superconducting magnets, combustion apparatus, computers, instrumentation and control systems, heat exchangers, steam generator (boiler), gas turbine, inverter, steam turbine
24. Considering the difficulty of obtaining enriched uranium, establish several natural uranium-heavy water cooled reactors which do not require enriched uranium
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) heavy water, natural uranium fuel
(B) pressure vessel
(C) natural uranium fuel element
(Ser) system plan, design, test fabrication, personnel training
(E) various types nuclear reactors, CANDU reactor (Canada), ATR reactor (Japan) are able candidates
28. Establish multiple stage comprehensive utilization system of heat of high temperature gas reactor (gas cooled nuclear reactor)
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (M) helium, super heat resistant alloy, heat resistant insulating material, insulators
(C) heat pipe, pipes
(E) helium gas turbine, heat exchanger, heat pump
32. Nonpolluting large output fuel cell power plants will become practical for siting around large urban centers
33. (+) research and development establishment efforts
34. (-) costs, investment, scale

[Key continued on following page]

35. (M) catalysts, electrodes, electrolytes, barrier material
(Sys) reassessment of power supply system
(C) large cell tanks, pipe
(E) heaters, pumps, inverter, transformer.
Nonpolluting as combustion product is water. Natural gas works well and is highly efficient.

36. High temperature gas reactor will become practical not only for power generation but as steelmaking, fuel refining, and chemical industry heat source for large volume utilization of nuclear energy

37. (+) research and development establishment efforts

38. (-) costs, investment, scale

39. (M) heat medium, super heat resistant alloys, super heat resistant insulators, nuclear power related rare earth metals, helium
(E) high temperature cracking tower, tank, computer, measurement and control system, heat exchanger, pump, high temperature gas reactor.
A comprehensive combinat centered on a nuclear reactor will be established

40. Efficient drilling and construction technology for deep underground layers will be developed and storage facilities, energy facilities, and production and fabrication facilities will be readily and economically sited underground

41. (+) organizational role of administration

42. (-) costs, investment, scale

43. (M) high strength concrete, foundation reinforcing agent
(B) underground oil and gas storage facility, underground thermal power plant, underground nuclear power plant
(C) pipes, reinforced piles
(Ser) geologic survey plans, designs, TA, engineering
(E) drilling machines, transport machinery

44. The high temperature gas cooled reactor will be the nucleus of a helium gas turbine top steam turbine power generator, steam supply to industries, multiple stage heat utilization, and local heating and cooling systems as part of a total energy combinat which will become practical

45. (+) industry and firm efforts

46. (-) costs, investment, scale

47. (M) super heat resistant alloys, helium, nuclear power related rare earth metals, super heat resistant insulating materials, thermal insulators, heat media
(C) pipe, valves
(Ser) system plans, design, engineering
(E) heat exchanger, helium gas turbine, steam generator, boiler, absorption type cooler, computer, measurement and control system

48. In sea, on sea, and undersea marine space will become commercial space for production, base fuel storage, waste disposal, and power generation taking full cognizance of the hazards of earthquakes and tsunamis

49. (+) industry and firm efforts

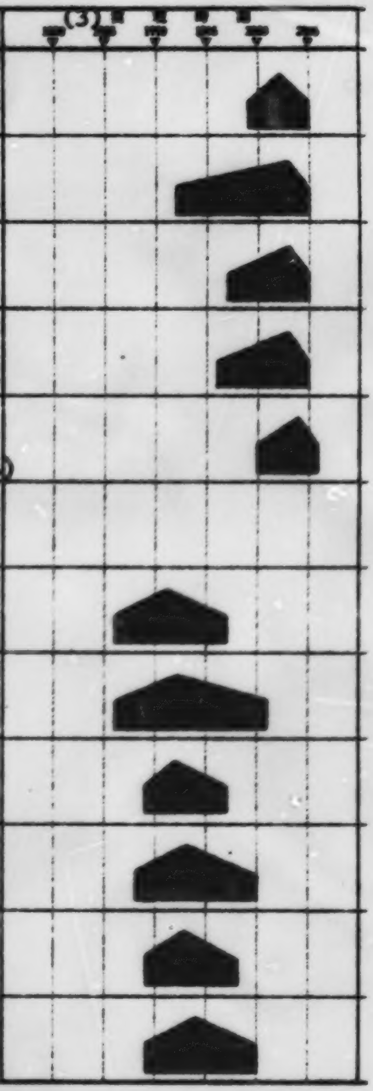
50. (-) costs, investment, scale

51. (M) sea water resistant steel, sea water resistant concrete, FRP buoyant material
(B) marine engineering projects, marine construction projects, large impact absorption system
(C) sea water resistant pile, large FRP structural material
(Sys) feasibility study
(E) working ship, at sea welding ship, submarine operation ship
(Ser) TA, environmental assessment, activities at sea are important area of marine development

[Key continued on following page]

52. Practicalization of power storage system into sealed space using superconducting coils for peak load power supply
53. (+) research and development establishment efforts
54. (-) costs, investment, scale
55. (M) superconducting wire, helium, super low temperature insulating material
(C) superconducting cable, pipe
(B) superconducting magnetic coil, inverter, switch mechanism, thyrister, helium liquefier. Research has been initiated at the Tsukuba High Energy Physics Laboratory. Higher efficiency than water pump-up power generation

(1) [illegible]	[illegible] (2)
27	陸上産のウラン価格が大幅に上がるので、海水中の溶存ウランを回収する実用規模プラントを、わが国の手で少なくとも3ヵ所つくり、ウラン自給率を上げると同時に、海外から買うときのバーゲニング・パワーを強める(8)
28	核融合炉の実証炉が完成し、実用第1号炉にはまだ間があるが、重水素、リチウム（三重水素源）等の生産、備蓄が問題になっている。(12)
29	わが国が年間必要とするウラン、トリウムなど核燃料の20%を海水溶存物質の回収によって入手する段階になっている。(16)
30	核融合炉にとって重要な三重水素源であり、陸上資源が限られ偏在しているリチウムを海水中から入手することが重要な課題になっている。(20)
31	ウラン、トリウム、リチウム、ストロンチウム、重水素、[illegible]中貴金属などの海水中に溶存する重要な資源を回収、精製する施設が少なくとも3ヵ所、日本近海に設置され、コマーシャル・ベースで稼動するようになっている(24)
	(28) 代替エネルギー
1	カナダ、ブラジルなど資源豊富な地域にオイルシェール、タールサンドから石油化学原料を抽出する事業が企業化され、わが国の企業も多数合弁で参加している。(29)
2	低質石油（アスファルト、ピッチ）は、砂漠地帯の土壌改良、緑地化用のアスファルト・シートとしてさかんに利用されるようになる。(33)
3	石炭を原料とする高カロリー・ガスが天然ガスとほぼ同じ価格で使用できるようになる。(37)
4	地熱の利用が軌道にのり、農業、畜産、工業用電力、地域冷暖房、水産養殖、観光などに多目的利用するシステムが全国各地でかなり実用化される（北海道、東北、九州など）。(41)
5	液化脱硫石炭が石油とほぼ同じ価格で供給される。(45)
6	年間を通じて暖冷房に必要なエネルギーの40%を太陽光線から得るソーラー・ハウスがわが国の年間新築住宅戸数（アパート、一戸建てをとわず）の15%を超える(49)



Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comments
8. The price of land produced uranium will go up. To counter this situation, at least three plants will be sited in Japan for practical scale recovery of uranium in sea water to enhance uranium self-sufficiency and improve bargaining power for foreign purchases
9. (+) research and development establishment efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) 促進・抑制条件	コメント (7)
68.8	0.62	(9) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (10)	Ⓜ吸着剤、イオン交換樹脂、耐海水鋼、耐海水コンクリート、耐海水モルタル。Ⓔ吸着装置、脱着装置、透析装置、ポンプ、湿式冶金装置。Ⓑ潮汐利用回収ステーション、海上ダム、発電所温排水利用回収ステーション。Ⓒパイプ、吸着板、吸着カラム。ⓈTA、環境アセスメント。 (11)
85.2	0.70	(13) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (14)	Ⓜイオン交換樹脂、吸着剤、耐海水鋼、耐海水コンクリート、Ⓒ吸着板、Ⓑ潮汐利用回収ステーション、海上ダム、発電所温排水利用回収ステーション。Ⓔ吸着装置、脱着装置、透析装置、電解装置、ポンプ、湿式冶金装置。三重水素は自然にはほとんどなく、リチウムに中性子をあてて造らねばならない (15)
77.8	0.65	(17) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (18)	Ⓜ吸着剤、イオン交換樹脂、耐海水鋼、耐海水コンクリート、耐海水モルタル。Ⓒパイプ、Ⓑ潮汐利用回収ステーション、発電所温排水利用回収ステーション。ⓈTA、環境アセスメント。海水溶存ウラン、リチウムなどを回収する海水化学産業は21世紀前半の日本の有力産業になるかも。 (19)
83.3	0.68	(21) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (22)	Ⓜ[illegible]吸着剤、イオン交換樹脂、耐海水鋼、耐海水コンクリート、耐海水モルタル。Ⓒ吸着板、イオン交換樹脂膜、パイプ。Ⓑ潮汐利用リチウム回収ステーション、海上ダム。Ⓔ吸着装置、脱着装置、透析装置、ポンプ。 (23)
80.0	0.65	(25) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (26)	Ⓜ吸着剤、イオン交換樹脂、キレート樹脂、耐海水鋼。Ⓑ潮汐利用回収ステーション、海上ダム。ⓈTA、環境アセスメント。Ⓔ吸着装置、脱着装置、透析装置、湿式冶金装置。世界の海水中には45億トンのウランがとけているが、ものすごく希薄なのが問題。それを何とかするのが技術。 (27)
85.7	0.71	(30) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (31)	(32) [illegible]、[illegible]装置、[illegible]装置、[illegible]装置、[illegible]装置。
67.4	0.67	(34) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (35)	(36) [illegible]。アスファルト[illegible]で[illegible]化し[illegible]する技術では日本は進んでいる。
82.6	0.68	(38) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (39)	(40) Ⓜ水素ガス、Ⓔ[illegible]装置、[illegible]ガス[illegible]炉、ガス化炉（クラスター炉など）、加圧水[illegible]ガス化装置。
84.0	0.69	(42) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (43)	(44) Ⓜ[illegible]パイプ、鋼管。Ⓔ熱交換器、ポンプ、タービン発電機。Ⓢさく井工事。
76.1	0.67	(46) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (47)	Ⓜ原料（アスファルト、ピッチ等）、添加水素、触媒、[illegible]。Ⓔ[illegible]加圧液化反応器、粉砕機、[illegible]装置。石炭液化では世界の主要企業グループが激しい競争。日本勢も頑張っている。 (48)
90.7	0.74	(50) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (51)	(52) Ⓜ[illegible]、[illegible]（リチウム化合物など）。Ⓔ太陽熱選択吸収板、太陽光[illegible]透過パネル、Ⓔ[illegible]式冷凍装置、熱交換器、蓄熱器、ヒートポンプ、ポンプ、コンプレッサ。蓄熱技術の開発が決め手になる。夏蓄えた熱を冬使ったり。

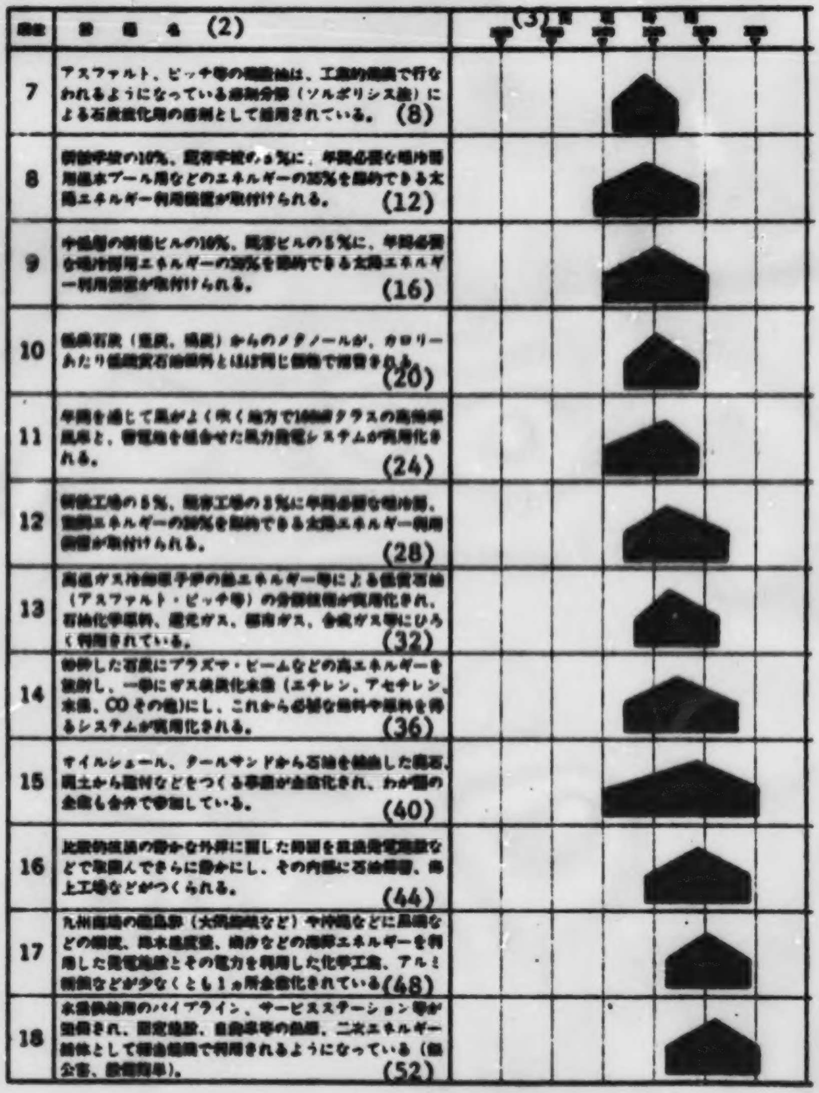
11. (M) adsorbants, ion exchange resins, sea water resistant steel, sea water resistant concrete, sea water resistant mortar
(E) adsorbing equipment, desorbing equipment, dialysis equipment, pump, wet metallurgical equipment
(B) tide utilization and recovery system, sea dams, power plant waste hot water utilization and recovery station
(C) pipe, adsorption plate, adsorption column
(Ser) TA, environmental assessment
12. A demonstration nuclear fusion reactor will be completed While the practical reactor will still be some time away, the stockpiling of heavy hydrogen and lithium (sources of tritium) is a problem
13. (+) research and development establishment efforts
14. (-) costs, investment, scale

[Key continued on following page]

15. (M) ion exchange resins, adsorbants, sea water resistant steel, sea water resistant concrete
(C) adsorbing plate
(B) tidal utilization and recovery station, sea dam, power plant waste hot water utilization and recovery station
(E) desorbing equipment, adsorbing equipment, dialysis equipment, electrolytic equipment, pump, wet metallurgy equipment. There is no natural tritium, and it has to be produced by reacting neutrons with lithium
16. A system in which 20 percent of Japan's uranium and thorium needs are provided from the sea will be established
17. (+) research and development establishment efforts
18. (-) costs, investment, scale
19. (M) adsorbants, ion exchange resins, sea water resistant steel, sea water resistant concrete, sea water resistant mortar
(C) pipe
(B) tidal utilization and recovery station, power plant waste hot water utilization and recovery station
(Ser) TA, environmental assessment. Possibility that a marine chemical industry to recover uranium and lithium from sea water will become an important industry in Japan in the 21st century
20. The recovery of lithium from sea water which is an important source of tritium for the fusion reactor and whose resources on land are irregularly distributed will be an important problem
21. (+) research and development establishment efforts
22. (-) cost, investment, scale
23. (M) inorganic adsorbants, ion exchange resins, sea water resistant steel, sea water resistant concrete, sea water resistant mortar
(C) adsorbing plate, ion exchange membrane pipe
(B) lithium recovery system utilizing tides, sea dams
(E) adsorbing apparatus, desorbing apparatus, dialysis apparatus, pump
24. At least three plants to recover and purify uranium, thorium, lithium, strontium, deuterium, hydrogen, and noble metals dissolved in sea water will be constructed on the seas about Japan and operated as commercial bases
25. (+) research and development establishment efforts
26. (-) costs, investment, scale
27. (M) adsorbants, ion exchange resins, chelating agents, sea water resistant steel
(B) tide utilization and recovery system, sea dams
(Ser) TA, environmental assessment
(E) adsorbing apparatus, desorbing apparatus, dialysis apparatus, wet metallurgy apparatus. There is 4.5 billion tons of uranium dissolved in sea water, but the extreme dilution is problem. Just how to handle this is the technology involved
28. Substitute energy
29. The extraction of petrochemical raw materials from oil shale and tar sands located in the resources rich Canadian and Brazilian lands will be industrialized, and Japan's industry will be involved in some of these ventures
30. (+) industry and firm efforts
31. (-) costs, investment, scale
32. (M) steam
(E) heating and pressurizing equipment, cutting equipment, distillation equipment, separation equipment

[Key continued on following page]

33. Low grade oil (asphalt, pitch) can be utilized to improve soils of desert areas and cultivated areas as asphalt sheet
34. (+) industry and firm efforts
35. (-) costs, investment, scale
36. (E) water deterring plate forming machine. The technology to make the desert bloom through the use of asphalt water deterring sheet is advanced in Japan
37. High calorie gas produced from coal will be used at about the same price as natural gas
38. (+) research and development establishment efforts
39. (-) costs, investment, scale
40. (M) hydrogen gas
(E) fine pulverizer, high temperature gas reactor, gasification furnace (such as cluster furnace), pressurized water addition fluidized apparatus
41. The use of geothermal heat will go on stream and multipurpose systems for agriculture, animal husbandry, industrial power generation, regional heating and cooling, aquaculture, and touristry will become practical over the entire country (Hokkaido, Tohoku, Kyushu)
42. (+) research and development establishment efforts
43. (-) costs, investment, scale
44. (M) corrosion and heat resistant pipe, steel pipe
(E) heat exchanger, pump, turbine generator
(Ser) well drilling project
45. Liquid desulfurized coal will be consumed at about the same cost as oil
46. (+) industry and firm efforts
47. (-) costs, investment, scale
48. (M) solvents (asphalt, pitch, etc.) added hydrogen, heat medium, catalysts
(E) heated and pressurized liquid reaction tank, pulverizer, fluidized bed equipment. There is fierce competition between major industrial groups of the world on coal liquefaction. Japan is in the thick of this competition
49. Newly constructed building (apartments, single dwellings) which are solar houses extracting 40 percent of their necessary energy from the sun averaged over the year will exceed 15 percent of all buildings
50. (+) industry and firm efforts
51. (-) costs, investment, scale
52. (M) heat accumulator, heat medium (such as lithium compounds)
(C) selective solar ray absorption plate, selective solar ray transmission panel
(E) absorption type refrigerating equipment, heat exchanger, heat disperser, heat pump, pump, compressor. Heat storing technology will be controlling factor. May be possible to use heat stored from the summer



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8	[illegible] (12)	
9	[illegible] (16)	
10	[illegible] (20)	
11	[illegible] (24)	
12	[illegible] (28)	
13	[illegible] (32)	
14	[illegible] (36)	
15	[illegible] (40)	
16	[illegible] (44)	
17	[illegible] (48)	
18	[illegible] (52)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comments
8. Residual oil such as asphalt and pitch are being used as solvent for coal liquefaction in the solvent decomposition (solvolysis) method on an industrial scale
9. (+) research and development establishment efforts
10. (-) cost, investment, scale
11. (E) high pressure heating facility, separation facility, mixing facility, ash removal facility, pump

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
81.4	0.68	(9) [illegible] (10)	(11) [illegible]、ポンプ。
89.5	0.70	(13) [illegible] (14)	(15) [illegible]、ヒートパイプ。[illegible]ヒートポンプ、[illegible]、ポンプ、コンプレッサ。
92.1	0.70	(17) [illegible] (18)	(19) [illegible]
67.4	0.64	(21) [illegible] (22)	(23) [illegible]。メタノールは石油よりカロリーは少ないがオクタン価高く、すぐれた[illegible]。
55.5	0.62	(25) [illegible] (26)	(27) [illegible]
80.8	0.68	(29) [illegible] (30)	[illegible](アンモニア、フレオンなど)、[illegible]、ヒートパイプ、[illegible]。ヒートポンプ、[illegible]、ポンプ、コンプレッサ。 (31)
82.2	0.66	(33) [illegible] (34)	[illegible]、ヘリウム、[illegible]、コンピュータ、[illegible]、ポンプ、[illegible]しうる。 (35)
71.4	0.63	(37) [illegible] (38)	(39) [illegible]、ポンプ、[illegible]、タンク、ホッパ、コンピュータ、[illegible]。
40.4	0.37	(41) [illegible] (42)	[illegible]、ベルトコンベヤ、[illegible]、ポンプ。[illegible]TA、オイルシェール、タールサンド[illegible]。 (43)
57.1	0.61	(45) [illegible] (46)	[illegible]コンクリート、[illegible]、TA、エンジニアリング、[illegible]。 (47)
60.9	0.64	(49) [illegible] (50)	[illegible]コンクリート、[illegible]、大口径FRPパイプ、[illegible]、大容量ポンプ、熱交換器、(フレオンなどを[illegible]とする)タービン、発電機。 (51)
82.7	0.67	(53) [illegible] (54)	[illegible]、水素ガスパイプライン、[illegible]、水素ガスポンプ、[illegible]。水素はエンジン用の「燃料」として、[illegible] (55)

12. Solar energy utilizing equipment to enable 35 percent energy economy over a year have been installed on 10 percent of new schools and 5 percent of existing schools utilizing the hot water pool concept
13. (+) organizational role of administration
14. (-) costs, investment, scale
15. (M) heat medium, insulators

    (C) selective light transmission panel, selective sunlight absorption panel, heat pipe

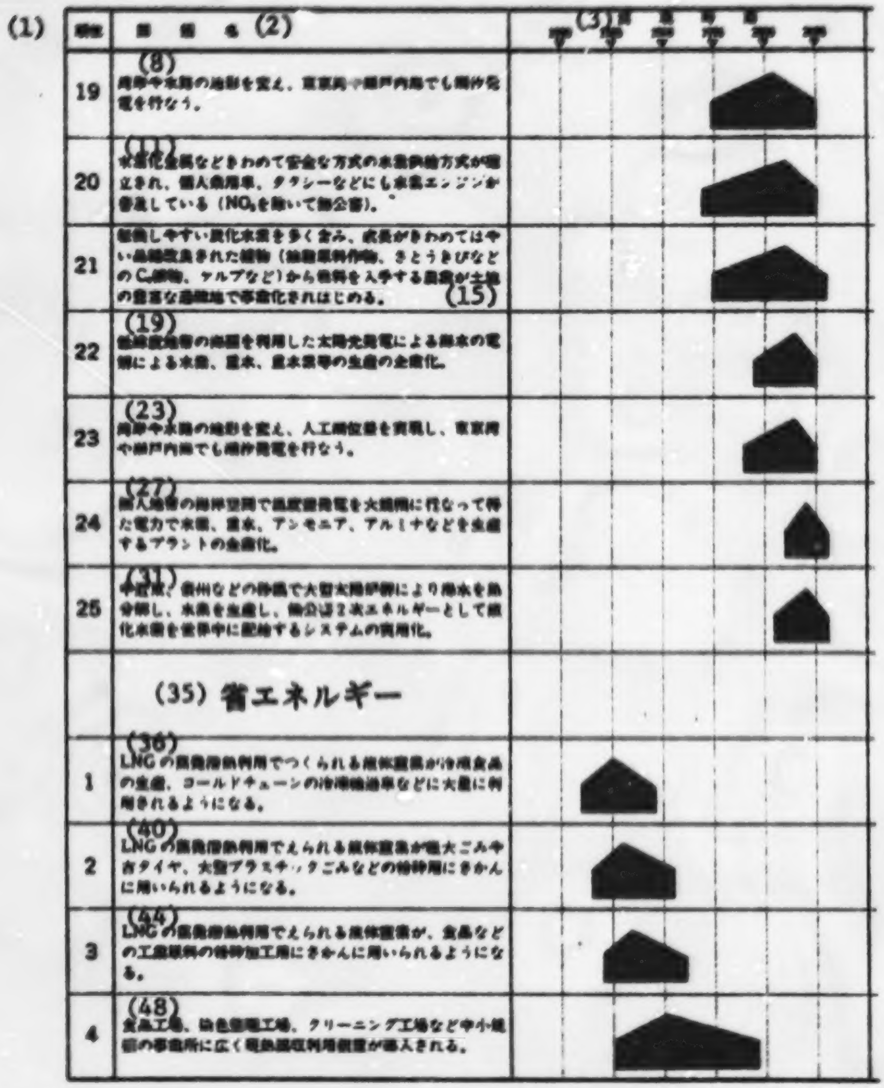
    (E) heat pump, absorption type cooler, heat disperser, heat exchanger, pump, compressor
16. Solar energy utilizing equipment to enable 30 percent energy economy for heating and cooling have been installed on 10 percent of new middle and lower class homes and in 5 percent of existing buildings

[Key continued on following page]

17. (+) industry and firm efforts
18. (+) research and development establishment efforts
19. (M) heat medium, insulator
    (C) selective solar ray transmission panel, solar ray absorption panel
    (E) absorption type cooler, heat exchanger
20. Methanol prepared from low grade coal (lignite, peat) can be used at about the same cost as low sulfur oil
21. (+) research and development establishment efforts
22. (-) costs, investment, scale
23. (M) oxygen, water vapor, catalyst, hydrogen
    (E) fine pulverizer, high temperature and pressure reaction tower, finely powdered coal gasification furnace (production of synthesis gas). Methanol is a low calorie but high octane and superior nonpolluting fuel compared to oil
24. A wind powered power generation system has been developed to operate high efficiency windmills of a 100 kW class over a year to be used where there is good wind the year around
25. (+) research and development establishment efforts
26. (-) costs, investment, scale
27. (M) high specific strength material
    (C) large storage battery
    (E) high efficiency wind powered generator
28. Solar energy utilizing equipment to enable 30 percent economy in heating and cooling energies have been installed in 5 percent of new plants and 3 percent of existing plants
29. (+) research and development establishment efforts
30. (-) costs, investment, scale
31. (M) insulators, heat medium (ammonia, freon, etc.), heat storage material
    (C) pipe, heat pipe, solar energy absorption panel
    (E) heat pump, heat exchanger, absorption type cooler, heat storage tank, pump, compressor
32. Cracking technology on low grade oil (asphalt, pitch, etc.) using thermal energy from sources such as high temperature gas cooled reactor will become practical for utilization in production of petrochemical raw materials, reducing gas, city gas, and synthetic gas
33. (+) research and development establishment efforts
    (+) industry and firm efforts
34. (-) costs, investment, scale
35. (M) heat medium, super heat resistant alloys, heat resistant insulators, helium
    (C) valves
    (E) high temperature cracking tower, computer, measurement and control facility, heat exchanger, pump, high temperature gas reactor. The gas center that combines the high temperature gas-cooled nuclear reactor and low-grade hydrocarbons will play a very important role
36. System to irradiate high energy plasma beam on crushed coal to generate hydrocarbons (ethylene, acetylene, hydrogen, CO, etc.) and then produce necessary fuel and raw materials will become practical
37. (+) research and development establishment efforts
38. (-) costs, investment, scale

[Key continued on following page]

39. (E) fine pulverizer, combustor, pump, plasma chemical reactor, separator, tank, hopper, computer, instrumentation and control facility
   (Sys) plasma chemical system
40. Industry to produce building materials from the waste rock and soil following the extraction of oil from oil shale and tar sand will be developed, and Japan's industry will participate
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) various bonding materials, various reinforcing materials
   (E) pulverizer, mixer, various ceramic kilns, various forming devices, belt conveyer, various pollution prevention devices (such as dust collectors), water tank, pump
   (Ser) environmental TA. It is important that oil shale and tar sand development not cause environmental destruction following development
44. Ocean surface of comparative calm will be enclosed by sea wave power generation facility to make the surface more calm for the placement of oil storage and sea based plants
45. (+) research and development establishment efforts
46. (-) costs, investment, scale
47. (M) sea water resistant steel, sea water resistant concrete, sea water resistant mortar, sea water resistant steel chain, flotation material
   (E) wave power generation buoy, generator
   (B) marine engineering projects, marine construction projects
   (Ser) geologic survey, planning and designing, TA, engineering.
   Japan is leading country in wave power generation
48. Power plants utilizing ocean energy such as the tidal flow of the Black Current, sea water temperature differential, and tides and chemical plants utilizing the power will be sited along the islands south of Kyushu (such as in the Osumi Strait) where at least an aluminum refining plant will be located
49. (+) organizational role of administration
50. (+) industry and firm efforts
51. (M) sea water resistant steel, sea water resistant concrete, sea water resistant mortar, heat medium, sea water resistant steel chain
   (C) large diameter FRP pipe, undersea power cable
   (B) marine engineering projects, marine construction projects
   (E) low pressure differential hydropower turbine, large capacity pump, heat exchanger (using fluid such as freon as operating liquid), turbine, generator
52. Hydrogen supply pipeline and service stations will be installed to provide heat sources for fixed facilities, automobiles, etc. as secondary energy carriers of considerable scale (nonpolluting, simple facilities)
53. (+) research and development establishment efforts
54. (-) costs, investment, scale
55. (M) metal hydride hydrogen storing material, super low temperature insulators, super low temperature construction material
   (B) pipeline laying project
   (C) liquefied hydrogen cylinder, hydrogen gas pipeline
   (E) catalytic combustor, liquid hydrogen vaporizer, liquid hydrogen cylinder, hydrogen gas cylinder, liquid hydrogen tank. Hydrogen is an engine fuel which is nonpolluting and may take up where oil leaves off.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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comment
8. Alter the terrain of bays, shores, and sea route for tidal power generation using Tokyo Bay and the Inland Sea as examples
9. (+) research and development establishment efforts
10. (M) sea water resistant steel, sea water resistant concrete, sea water resistant mortar
    (S) shallow water sea dams, marine engineering projects
    (C) undersea cable
    (Ser) marine environmental assessment, TA, geological survey
    (E) low pressure drop hydropower turbine, generator, unmanned transport control system, computer, communication system

(4) [illegible] (%)	(5) [illegible]	(6) 促進・抑制条件	コ メ ン ト (7)
48.6	0.38	(9) ⊕研究開発機関の努力	(10) [illegible]
86.7	0.67	(12) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (13)	Ⓜ水素化金属水素貯蔵材(鉄、チタン、リチウム、その他)、耐超低温構造材、耐超低温断熱材。Ⓒ液化水素ボンベ、水素化金属水素貯蔵器。Ⓑ水素供給スタンド。Ⓔ液化水素気化器、水素化金属からの水素ガス取出し装置。 (14)
50.6	0.55	(16) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (17)	[illegible] (18)
64.8	0.60	(20) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (21)	[illegible] (22)
36.1	0.35	(24) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (25)	[illegible] (26)
61.1	0.37	(28) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (29)	[illegible] (30)
60.0	0.38	(32) ⊕研究開発機関の努力 ⊖費用・投資の額・規模 (33)	[illegible] (34)
86.3	0.74	(37) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (38)	(39) [illegible]
83.3	0.72	(41) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (42)	(43) [illegible]
69.4	0.68	(45) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (46)	[illegible] (47)
61.2	0.64	(49) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (50)	(51) [illegible]

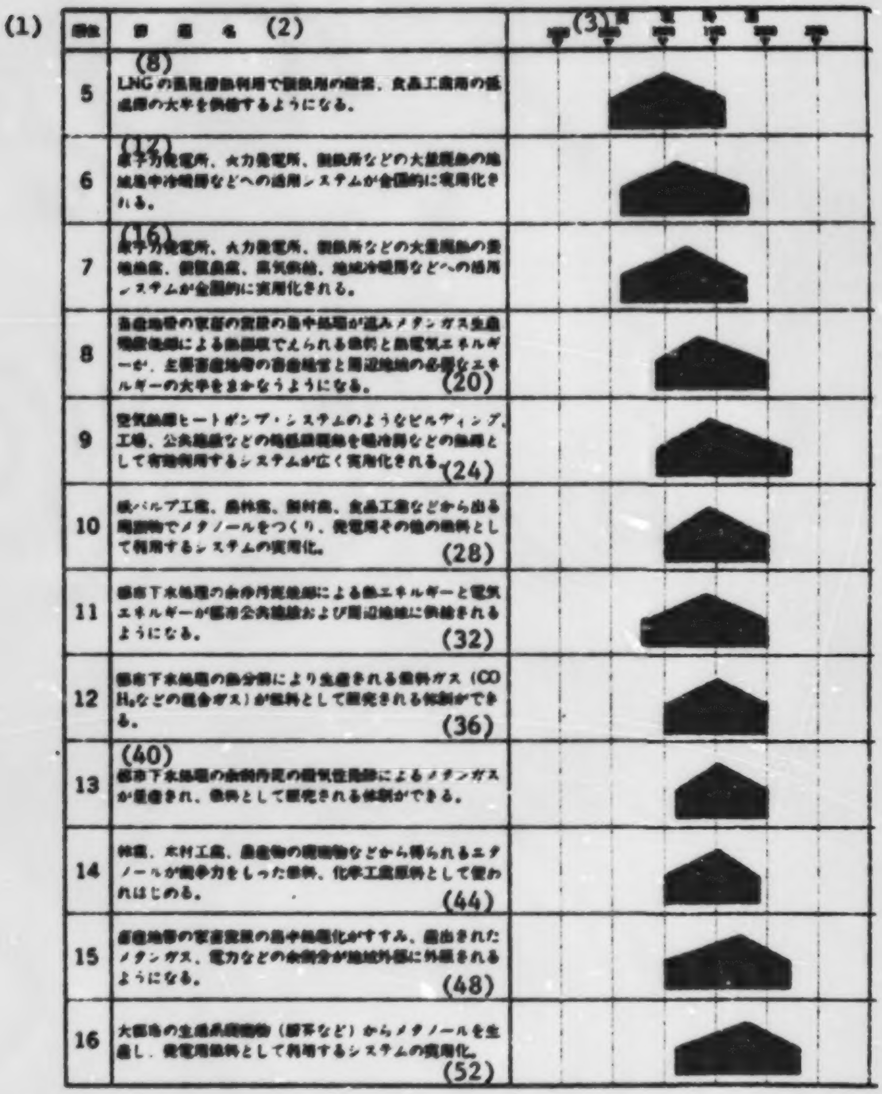
11. Very safe hydrogen storage methods such as through metal hydrides will be developed to be used to power individual automobiles and taxis (nonpolluting except for NO_2)
12. (+) research and development establishment efforts
13. (-) costs, investment, scale
14. (M) metal hydride hydrogen storage steel (steel, titanium, lithium, others), super low temperature resistant construction material, super low temperature resistant insulating materials
    (C) liquid hydrogen cylinder, metal hydride hydrogen storage container
    (B) hydrogen supply station
    (E) liquid hydrogen vaporizer, facility to extract hydrogen from metal hydride

[Key continued on following page]

15. Agriculture to produce quality improved plants which contain high levels of readily convertible hydrocarbons which grow very rapidly (oily raw materials products, sugar cane type C_4 producing plants, kelp, etc.) will be promoted on abundant but excessively poor land
16. (+) research and development establishment efforts
17. (-) costs, investment, scale
18. (M) search for superior plants and improvement of species, search and improvement of enzyme producing bacteria, solidified enzymes
(E) high temperature and pressure reactor, preprocessing facility (sectioning, pulverizing, etc.)
19. Industrial production of hydrogen, deuterium, and heavy water by the electrolysis of sea water using solar energy generated electricity utilizing the ocean surfaces of the low latitude regions
20. (+) research and development establishment efforts
21. (-) costs, investment, scale
22. (M) selectively permeable membrane material, silicon ribbon, chemical semiconductor ribbon, sea water resistant steel, ion exchange resin
(C) selectively permeable membrane, solar battery, ion exchange resin membrane
(Ser) TA, environmental assessment
(E) giant raft system, light reception plate cleaning system, raft positioning system. To be directed to electrochemical industry using low voltage DC
23. Altering the terrain of bays, shorelines, and waterways to introduce artificial tidal differential and generate electricity from tides such as in Tokyo Bay and the Inland Sea
24. (+) research and development establishment efforts
25. (-) costs, investment, scale
26. (M) sea water resistant steel, sea water resistant concrete
(B) shallow ocean dam, marine engineering projects
(C) underseas cable
(Ser) marine environmental assessment, TA, geologic survey
(E) low pressure drop hydropower turbine (such as Chupler turbine), generator, unmanned transport control system, computer, communication system
27. Industrialization of plants to produce hydrogen, heavy water, ammonia, or aluminum using power generated from large scale generators operated by temperature differential in large unmanned ocean areas
28. (+) research and development establishment efforts
29. (-) costs, investment, scale
30. (M) heat medium, sea water resistant steel, sea water resistant concrete, sea water resistant mortar
(C) large diameter FRP pipe, pipe, underseas power cable
(B) at-sea factories, undersea factories, sea water temperature differential power plant
(E) turbine using operating fluid such as freon, generator, electrolysis facility. In-sea state assessment is important
31. Practical development of hydrogen production process to thermolyze hydrogen from sea water using large solar reactors in the deserts of the middle east and Australia and supplying liquid hydrogen as a nonpolluting secondary energy
32. (+) research and development establishment efforts
33. (-) costs, investment, scale

[Key continued on following page]

34. (M) sea water resistant steel, sea water decomposition catalyst
(B) solar reactor battery site
(C) sea water supply pipe line, weather resistant reflection mirror, chlorine cylinder, liquid hydrogen pipeline
(Ser) TA
(E) sea water decomposition reactor, large solar furnace, sun tracking facility, computer, automated control facility, hydrogen collection facility, hydrogen liquefaction facility. Research is being conducted in earnest in the United States
35. Energy conservation
36. Liquid nitrogen produced by the utilization of the latent heat of vaporization of LNG will be utilized to produce frozen foods and in the operation of cold chain refrigerated trucks
37. (+) industry and firm efforts
38. (-) costs, investment, scale
39. (M) low temperature insulators
(C) liquid nitrogen cylinder
(E) refrigerating facility with liquid nitrogen connection, vaporized low temperature nitrogen gas recovery and utilization facility
40. Liquid nitrogen produced by the utilization of the latent heat of vaporization of LNG will be used to powder large garbage particles, old tires, and large plastic masses
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) low temperature insulator, low temperature resistant steel, liquid nitrogen
(C) liquid nitrogen cylinder
(E) belt conveyer, pulverizer, low temperature nitrogen gas reutilization facility
Test plant in operation at the Clean Japan Center (Foundation).
44. Liquid nitrogen produced by the utilization of the latent heat of vaporization of LNG will be used to prepare powdered food products
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (M) low temperature insulator, low temperature resistant structural material (such as stainless steel, aluminum), liquid nitrogen
(C) liquid nitrogen cylinder
(E) pulverizer, low temperature nitrogen gas reutilization facility.
Use has begun on special types of foods and drugs which are difficult to crush such as spices.
48. Waste heat recovery and reutilization facilities will be widely used in businesses of small to medium scale such as food plants, dyeing plants, and cleaning plants
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (M) thermal insulators, heat medium
(E) heat exchanger, boiler-use economizer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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, impeding conditions
7. Comment
8. Oxygen for steelmaking and greater fraction of low temperature for food industry will be provided through the utilization of latent heat of vaporization of LNG
9. (+) industry and firm efforts
10. (-) costs, investment, scale
11. (M) super low temperature resistant material, super low temperature insulator
    (C) super low temperature resistant valve, super low temperature resistant pipe
    (E) low temperature heat exchanger, tank, pump

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
68.5	0.72	(9) [illegible] (10)	[illegible] (11)
82.0	0.70	(13) [illegible] (14)	[illegible] (15)
90.7	0.72	(17) [illegible] (18)	[illegible] (19)
60.0	0.63	(21) [illegible] (22)	[illegible] (23)
71.0	0.66	(25) [illegible] (26)	[illegible] (27)
74.6	0.68	(29) [illegible] (30)	[illegible] (31)
66.7	0.67	(33) [illegible] (34)	[illegible] (35)
61.1	0.63	(37) [illegible] (38)	[illegible] (39)
63.5	0.63	(41) [illegible] (42)	[illegible] (43)
50.0	0.60	(45) [illegible] (46)	[illegible] (47)
61.1	0.61	(49) [illegible] (50)	[illegible] (51)
54.7	0.62	[illegible] (54)	(53) [illegible] (55)

12. Systems for regional concentrated heating and cooling using large volume waste heat from nuclear power plants, thermal power plants, and steelmaking plants will be made practical throughout the country
13. (+) organizational role of administration
14. (-) costs, investment, scale
15. (M) insulation material
    (C) heat pipe, pipe
    (E) heat exchanger, pump, heat pump, absorption type cooler, pump, steam generator
16. Systems for utilizing large volumes of waste heat from nuclear power plants, thermal power plants, and steelmaking plants for fish culture, greenhouse agriculture, steam supply and regional heating and cooling will be made practical throughout the country
17. (+) organizational role of administration
18. (-) costs, investment, scale

[Key continued on following page]

19. (M) insulation material
(C) heat pipe, pipe
(E) heat exchanger, pump, heat pump, absorption type cooler, heat dissipator, steam generator
20. Animal wastes from domesticated animals grown in farm animal raising regions will be collected and treated to produce methane, the residue will be combusted to recover its heat, and this heat and electrical energy and heat will be used to provide the greater part of the energy necessary to run the animal husbandry business
21. (+) organizational role of administration
22. (-) costs, investment, scale
23. (M) corrosion and fire resistant construction material, search and improvement on high performance enzyme producing bacteria
(C) gas tank, gas collector, pipe
(E) fermentation vat, incineration furnace, boiler, turbine generator, pump. A mature pig excretes about the same quantity of waste as 10 mature men. The problem child of animal husbandry will be converted into a resource.
24. Systems to effectively utilize very low level waste heat from buildings, plants, and public facilities heat pump systems as heat sources for heating and cooling will become practical
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) insulation material, heat medium
(C) pipe, heat pipe
(E) heat pump using air heat reservoir, heat exchanger, absorption type cooler, heat dissipator, pump, compressor. Even the heat given off by people working in a building can be considerable when a large number is involved. Systems of this type are being developed.
28. Practical development of a system to prepare methanol from the wastes of the paper pulp industry, agriculture and forestry product industries, lumber industry, and food industry which will be used as fuel for generating power and other applications
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (M) catalysts
(E) high temperature and pressure methanol production tower.
Methanol is a nonpolluting material which can be used for power production and in automobiles.
32. Excess sludge from urban sewer systems will be incinerated to provide thermal energy to be used in city public facilities and surrounding regions
33. (+) organizational role of administration
34. (-) costs, investment, scale
35. (M) corrosion and fire resistant construction material
(E) sludge incinerating furnace boiler, turbine, generator. Several thousand to 10,000 plus kW power can be generated from a single sewage treatment plant of a large city
36. Fuel gas (mixed gas containing CO, H_2, etc.) produced by urban sewer systems will be sold as fuel
37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (E) thermolytic tower

[Key continued on following page]

40. A system to produce methane gas from urban sewer sludge by anaerobic fermentation will be developed
41. (+) organizational role of administration
42. (-) costs, investment, scale
43. (M) search for bacteria species and their culture
(E) anaerobic fermentation vat, gas collector, tank
44. Ethanol produced from the forest industry, lumber industry, and agricultural wastes will become competitive fuel and chemical industry raw material
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (M) search for enzyme producing bacteria and their improvement, fixing enzymes, catalyst
(E) biochemical reaction facility, high temperature and pressure reaction facility, pretreatment facility
48. Collection and treatment of animal urine in farm animal growing areas will be developed and the methane gas produced along with excess power generated will be sold to other regions
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (M) search and culture of high performance methane forming enzyme bacteria, heat and corrosion resistant material, insulating material
(C) gas tank, pipe, valve
(E) large anaerobic fermentation vat, gas collector
52. Methanol will be produced from the wastes generated by large cities and used as fuel for power generation in the system to be developed
53. (+) organizational role of administration
(+) research and development establishment efforts
54. (-) costs, investment, scale
55. (M) catalysts
(E) pretreatment facility (pulverizer, etc.), high temperature and pressure reaction container

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CSO: 8129/1906

ESTABLISH SIX STRATEGIC TARGETS AND STRIVE TO ACQUIRE RESOURCES

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 48-57

[Article on food assurance pp 37-47 omitted]

[Article by Junnosuke Kawamura]

[Text] Resources

Emergence of Resources Nationalism

Coal is probably the only one among the resources which Japan can be said to possess in somewhat abundant degree on a worldwide basis in this recent industrial age. Before the days of high economic growth, Japan was blessed with comparatively abundant coal, hydroelectric power, iron sulfide ore, and copper ore. Coal and limestone together with hydroelectric power produced carbide and acetylene. These were used as raw materials for organic synthesis to produce items such as vinyl chloride.

When a high rate of growth set in, carbide and acetylene were engulfed by the large wave of petrochemical development, and the importance of iron sulfide and copper ores as raw materials for the heavy chemical industry was quickly lost as the result of Japan's and the world's changes in the chemical production area.

Because Japan's coal seams are very thin and are found in very severely inclined layers, coal began to be imported, and its importance as a domestic resource was waning even before the days of oil. Hydroelectric power could not keep up with the sharply increasing demand and dimmed in importance before the emergence of oil, gas, and nuclear power. In this manner, limestone alone was left among the native resources.

Since World War II Japan has taken advantage of various conditions to overcome its lack of resources to acquire the necessary resource items such as minerals, food, and energy in the necessary volume, quality, time, and price very close to what it deemed necessary. These raw materials were then processed to conduct trade under conditions advantageous to itself.

The belt along the Pacific coast on the bordering seas and close to the large consumption regions became the sites for heavy industry including iron and steel, chemical, and nonferrous metal industries where practically every resource item including oil, coking coal, and metal ores could be obtained in a stable manner for long periods at low price. At the same time, special ore carrying ships and ULCC, VLCC (giant tankers) type intercontinental transport technological revolution was activated. In addition, the large scale technology of heavy chemistry technology which had undergone a revolution just after World War II was being commercialized and exported by other countries, and this was imported in great quantity to transform Japan to one of the world's newest "heavy chemical plants" in a short time which supplied materials of good quality and modest price to the world.

This situation was not to continue forever, and there was a decisive reversal as the result of the oil shock of December 1973. Resources nationalism started with oil (this is not precisely true), and the possibility of its spread to other resource items such as wood materials, food, uranium, bauxite, and iron ore became apparent.

Strengthening of the Leading Western Countries

In this manner, resources could be purchased under any conditions one cared to place. This is why the seller-side countries banded together in an organization that strengthened price limits to maintain and increase prices. They began to plan to hold their resources for long time even after their country's industrialization had become completed. In addition, where a country had formerly sold the raw material resource product as is, it began to increase the value of the product before sale.

The leading industrial countries such as the United States, the Soviet Union, Japan, West Germany, and France are pushing development of technology to procure certain items such as cobalt, nickel, titanium, and copper which have but limited supplies left on land and manganese nodules from the sea bottom. The international policy to enable the establishment of a stable system base has been the subject of vacillations of the so-called North-South problem. While they possess little technological clout nor capital, various southern countries which make up a large fraction of the membership in the United Nations have concerted their efforts and have stood in the way of establishing any policy for a long time. In this manner, many of these resource item related events are not proceeding in the manner that the leading countries would like to see.

It should be borne in mind that the flame of resource nationalism will be lit whenever the opportunity presents, and effort needs to be directed at responding to the challenge of such a situation.

Japan entered the road of modern industrialization as the latest member among the major leading countries as a result of which it did not have the time to bring the major resource exporting countries within its sphere of influence. For example, the African countries with abundant uranium, cobalt, copper, oil, and phosphate rock still are greatly influenced by the old regime countries such as Great Britain, France, and Belgium. Japan's industry has been struggling to work its way into these areas in order to develop imports of what it considers necessary.

Even after the storm which brewed from the independence movements following World War II, there was great expansion in resource prospecting, mining, transport, and also processing technology and experience on the part of big industry of these old regime countries, and capital and credit were directed in this direction. These companies still have great power over the directions taken by resource commodities in this world. Japan which appeared very late on the scene of industrial development finds itself at great disadvantage in the technology, experience, and credit for resource industries which exert such great influence on industrial development.

Recently, however, Japan has been able to initiate prospecting and development of uranium sources in West Africa, and it seems finally on the verge of actually engaging in resource development. What happens from here on should be watched with interest.

Utilization of Resources in the Sea

In the face of such a situation, it is naturally unreasonable to expect Japan to fashion itself an economy with authority where resource items are concerned. It is vital that raw material resources be acquired at high price, loss in dignity be absorbed, and a shift in price to the export product be made through raising the level of the production structure, accumulation of knowledge, and generation of technological strength for which the world must come to its door.

Even then it is necessary that we must make all-out efforts to strengthen our country's resource industry foundation in order to strengthen our bargaining power and negotiating power with respect to purchase of raw materials and energy products.

We must change over from the simple import mode of the past to a develop and import mode and accumulate experience and technology on prospecting, mining, and transport in a manner very similar to what it has been in the past.

In addition, efforts must be directed at the search and recovery of resources from regions not searched heretofore and which offer a high degree of freedom to bring into play substitute and low grade resources. There should also be the recycling of resources, and resources conserving technology needs to be put onto the right track to strengthen Japan's basic industrial strength. At the same time, its bargaining power and competitive strength must be bolstered.

It is thought that the following represents the pathway that Japan's industry should follow on the long term from here on. The world's resource industry under control of the major leading countries covers the resource laden areas with a tight network, but still there are some very small areas which have not been covered. These should be exploited even though the risk is great. A development and import system should be adopted, and the necessary technology and experience be accumulated. Search and development for oil and natural gas on the continental shelf of the seas around Japan should be expanded along with advances into deep inland areas and ocean bottoms. In addition, new areas such as recovery of resources dissolved in sea water need to be explored to establish a foundation for the future.

Development of Refining Technology of Sea Bottom Ores in the 80's

What are the technological development subjects that will overcome the limitations to Japan's industry on the resources front and enable stabilized existence and growth?

1) Recovery of resources from regions heretofore undeveloped, 2) use of resources not used in such manner before, 3) activation of development of substitute resources and low grade resources, 4) technological development to allow recycling of resources and regeneration of resources, 5) development of resource conservation technology, and 6) technological development to insure availability of industrial water. These are the six groups under which these subjects can be classified.

When the results compiled on technology predictions gathered in this survey were used as basis for establishing the relative time order by which they should be developed on the order of urgency, the following was obtained.

1) In the subject group concerned with recovery of resources from regions not heretofore utilized, the 5 years between 1986-1990 will have to see Japan develop technology to cope with the initiation of supply of the abundant mineral resources from the high latitude regions. At the same time, sea bottom drilling technology for depths up to 300 meters and seabed ore refining technology have to be developed to levels not required in the past.

Between 1991-1995, drilling into mineral strata on land at least three times the depths required in the past, developing resources under the Antarctic ice cap, recovery of manganese nodules at 3,000-5,000 meters depths from the ocean, and recovery of uranium, thorium, and lithium dissolved in sea water will begin to become practical on a wide scale.

The Japanese super high performance resources survey satellite will be operating constantly by the 1996-2000 era. The CO and CO_2 discharged by industry will be used as raw materials for organic synthesis in a carbon dioxide gas chemical industry. At about this time activity focused on resources found on the continental shelf will be in operation.

About 2001-2005 will see the use of solar energy power generation at the ocean surface of the low latitude belts to recover resources in sea water (heavy water, hydrogen) and the recovery of components dissolved in sea water from the peripheral seas of Japan.

2) The development subjects encompassing conversion of resources which had not been utilized in the past are expected to see the recovery of metal resources from urban trash in a so-called urban mining process along about 1986-1990 while the reduction of polymer wastes to raw materials and utilization as fuel and other applications is expected to reach higher levels than today.

The refining of low grade nickel ore such as laterite, conversion of paper scraps, forest wastes, and agricultural wastes to food and feed, and the use of waste and scrap exchange sites are expected to become practical in 1991-1995.

The period of 1996-2000 is expected to see large scale methane and methanol production from foreign and domestic lignite, brown coal, peat and similar material be established.

High Degree of Recycling Resources

3) Developmental subjects related to exploitation of substitute resources and low grade resources during 1986-1990 are expected to involve the production of a large fraction of petrochemical raw materials, ammonia synthesis gas, and reducing gas for steelmaking from heavy residual oil at a time when the need will become quite urgent.

The 1991-1995 period is expected to see in-place leaching and bacterial leaching of tailings from abandoned mines to recover more metal, and the production of methane and methanol from foreign and domestic lignite, brown coal, and peat will be even more advanced.

Utilization of continental shelf resources, recovery of metals dissolved in sea water, recovery of noble metals, and industrialization of carbon dioxide gas chemistry are expected to be on stream by 1996-2000.

4) Technology for recycling better than what is practiced now is expected by 1986-1990 on polymer, city, and industrial wastes (waste plastics, waste tires, old household electric products). Data banks and exchange sites will have been established for wastes and scrap that can be used as is or utilized as raw material, and large plants for dirty water cleanup, side products, and clean water will probably be built.

Along about 1991-1995 old liners, deteriorated tankers, and freighters built in the 60's and 70's will be dismantled by an industry that is expected to be developed all over the world. At the same time, an industry to produce SCP (single cell protein), methane, and methanol from cellulose family industrial waste and scrap paper will be fully developed.

5) Resources economizing technology of the 1986-1990 period will be development of "installization" of the animal husbandry industry, and the need for collecting and treating animal excrement will arise. It will become necessary to recover, prepare fertilizer, and generate feed through methane fermentation and incineration.

An effective utilization system for slag from steelmaking as landfill needs drop and systems for complete conversion of agricultural and marine product wastes will be completed through development of the necessary technology. The completion of a system which takes into account large type durable consumer goods, design of capital goods, dismantling reutilization during production, and convenience in conversion to resources may become extremely urgent about this time.

About 1991-1996 technology to utilize soil left over from construction and clearance systems on leftover dirt information will be set up and established, and production technology to recover valuable material from low grade and difficultly reducible resources such as nickel will be highly desirable.

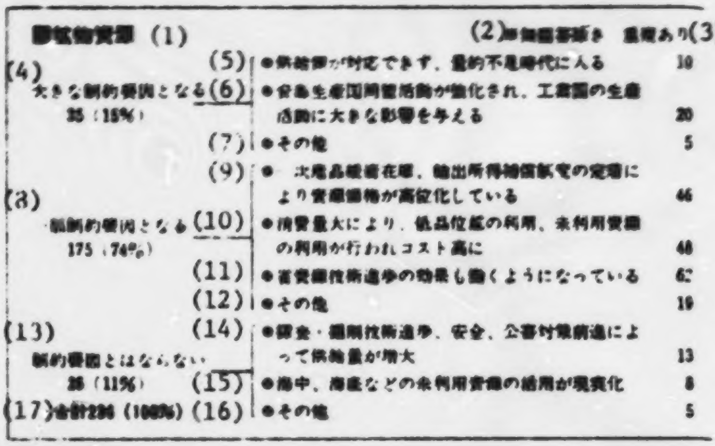
6) It is expected that accurate prediction technology to predict the volume of flood water following torrential rains will be developed in 1981-1985 in the area of technological development for assuring industrial water.

The 1986-1990 period will probably see the seacoast industrial belts of Kanto, Kinki, and northern Kyushu obtain a considerable fraction of their industrial fresh water from processed sewer water if the highly desirable technology is developed by then.

There is considerable anxiety that the cost of industrial water may rise higher than the cost of electric power in the Kanto, Kinki, and northern Kyushu coastline industrial belts along about 1991-1995.

Systems to reutilize highly treated city and industrial waste water through underground reduction will be developed and sewage treatment and fresh water facilities and installations will be made much more compact through development and improvements in chemical agents and machine installations. A waterways system to tie the waters of the Agano River and Shinno River to the Tone River system will become urgent.

It is expected along about 1996-2000 that energy complexes centered on high temperature gas cooled reactors will desalinate seawater to provide water that will be competitive in cost with industrial water. In addition, seawater desalination using solar energy in combination with power generation is also anticipated.

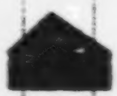
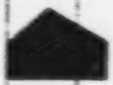
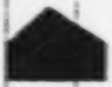
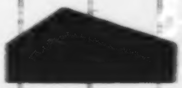
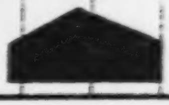


鉱物資源 (1)		(2)※無回答除き 重複あり(3)	
(4) 大きな制約要因となる 35 (15%)	(5)	●供給側が対応できず、量的不足時代に入る	10
	(6)	●資源生産国間協調が強化され、工業国の生産活動に大きな影響を与える	20
	(7)	●その他	5
(8) 制約的要因となる 175 (74%)	(9)	●一次產品緩衝在庫、輸出所得補償制度の定着により資源価格が高位化している	46
	(10)	●消費量大により、低品位鉱の利用、未利用資源の利用が行われコスト高に	40
	(11)	●省資源技術進歩の効果も働くようになっている	62
	(12)	●その他	19
(13) 制約要因とはならない 26 (11%)	(14)	●探査・採掘技術進歩、安全、公害対策前進によって供給量が増大	13
	(15)	●海中、海底などの未利用資源の活用が現実化	8
(17) 合計236 (100%)	(16)	●その他	5

Key:

1. Mineral resources
2. *Excluding no answers
3. Some duplications
4. Is a major limiting factor
5. The supply side cannot comply, and quantitative insufficiency era results
6. Joint actions by resource producing countries are strengthened and exert great influence on the production activities of industrial countries
7. Other
8. Is a partial limiting factor
9. Primary products buffer stocks and export income compensation system cause the price of resources to rise to high levels
10. Large consumption volume results in utilization of low quality ore and utilization of unused resources which add to cost
11. Effects of advances in conservations of resources are reflected
12. Other
13. Is not a limiting factor
14. Increase in supply volume due to advances in search and mining technology, safety and pollution prevention
15. Activity in recovery of unused resources from sea and sea bottom becomes real
16. Other

17. Total 236 (100%)

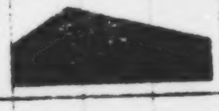
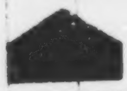
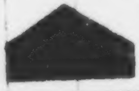
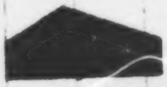
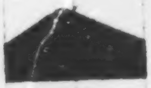
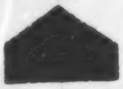
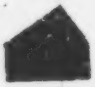
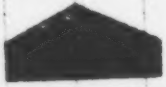
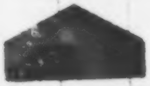
(1) 順位	課題名 (2)	(3) 実現時期 1980 1985 1990 1995 2000 2005
1	都市廃棄物（最初は粗大ごみ、廃棄自動車など）からの金属資源の回収、再利用が大都市周辺でコマーシャル・ベースにのる（アーバン・マイニング）。 (8)	
2	カナダ北部、アラスカなどの高緯度地帯の豊富な鉱物資源の開発がはじまり、わが国への有力な供給基地になる。 (12)	
3	今後、埋立用にあまり必要がなくなることもあり、鉄鋼業の鉱滓が、セメント、建材、骨材(砂利、砂)、土壌改良材などとしてほとんど100%有効利用されるようになる。 (16)	
4	量産型、大型の耐久消費財、資本財の設計のさいに、今後は耐用年数がつきたときに、部品、部材、材料の分解、再利用、再資源化がなるべく簡単に手間をかけなくてできるよう大きな注意がはらわれるようになる。 (20)	
5	アンモニア製造用の合成ガス、製鉄用の還元ガスなどの相当部分が重質残渣油（アスファルト・ピッチなど）の分解によってえられている。 (24)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Recovery of metal resources from urban waste (initially large trash, discarded automobiles) and the reuse of the metal go on commercial base (urban mining)
9. (+) organizational role of administration
10. (-) costs, investment, scale
11. (M) liquid nitrogen
    (E) sectioning machine, freezer pulverizer, gravity sorter, magnetic selector, compression press. Research and development on very low temperature crushing pilot plant is being promoted at several sites
12. Development of mineral resources in the abundant northern latitudes of Canada and Alaska will be initiated to provide Japan a powerful supply base
13. (+) political organizational role
14. (-) costs, investment, scale
15. (M) low temperature resistant high tensile strength steel
    (E) rig for use in high latitude cold temperature regions, mining and engineering equipment for high latitude cold temperature region use, transport and loading equipment for high latitude cold temperature region use, ice breaking submarine cargo ships (tanker, bulk carrier)

(4) 期待度 (%)	(5) 実現確率	(6) 促進・抑制条件	コ メ ン ト (7)
100.0	0.78	(9) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (10)	(材)液体窒素。(機)切断機、冷凍粉砕装置、重力選別機、磁力選別機、圧縮プレス。超低温粉砕法のパイロットプラントは数ヵ所で研究開発が進められている。 (11)
90.0	0.77	(13) ⊕政府の組織的役割 ⊖費用・投資の額・規模 (14)	(材)耐低温高張力鋼。(機)高緯度寒冷地帯用リグ、高緯度寒冷地帯用鉱山・土木機械、高緯度寒冷地帯用輸送・運搬装置、砕氷型氷貿物船（タンカー、バルクキャリア）。 (15)
87.2	0.75	(17) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (18)	(材)耐熱耐火構造材。(部)ヒートパイプ、パイプ。(機)粉砕機、微粉砕機、計量機、混合機、鉱滓綿製造機、熱交換器、ポンプ。(施)水滓製造所。(サ)TA。 (19)
81.6	0.74	(21) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (22)	(部)簡単で高度なファスナーの開発・改良。(シ)設計、部品、部材の標準化・規格化の国民経済徹底、簡単な結合・分解法の開発と標準化。 (23)
88.2	0.73	(25) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (26)	(材)熱媒体（砂、コークス、粉など）、触媒、装置用耐蝕材料。(機)分解塔、熱交換器（原子炉エネルギー利用の場合）、ポンプ、分離装置。原子力（高温ガス炉）熱源と結びついたとき最も効率的である。 (27)

16. There will be little need for landfill, and the large volume of mineral slag from the steel industry will be almost 100 percent utilized in cement, building materials (gravel, sand) and soil conditioner
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) heat and fire resistant structural material
(C) heat pipe, pipe
(E) pulverizer, fine pulverizer, measurement device, mixer, slag crusher, heat exchanger, pump
(B) liquid dregs production plant
(Ser) TA
20. Future design of volume production and large consumer goods and capital goods will be to enable simple dismantling and reutilization when the goods have lived their useful lives
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (C) development and improvement of simple and high quality fastener
(Sys) standardization of design, parts and materials, development of simple coupling and dismantling methods and their standardization to help the people's economy
24. A sizable fraction of the synthesis gas for ammonia production and reducing gas for steelmaking will be supplied from heavy residual oil (asphalt, pitch) decomposition
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) heat medium (sand, coke, powder), catalysts, corrosion resistant materials for equipment
(E) decomposition tower, heat exchanger (when nuclear reactor energy is used), pump, separator. Is most effective when coupled to a nuclear reactor (high temperature gas reactor) as heat source.

(1) 順位	課　題　名 (2)	(3) 実　現　時　期 1980　1985　1990　1995　2000　2005
6	石油化学の必要とするオレフィンの相当部分がアスファルト・ピッチなどの重質残渣油の分解によってえられる。(8)	
7	廃タイヤ、廃プラスチックなど、都市産業から出る高分子系廃棄物が収集輸送、処理技術の進歩と資源価格の上昇により、原料、燃料として還元され、現在よりも高度な循環利用形態になっている。(12)	
8	関東臨海、近畿臨海、北九州の工業地帯で必要な工業用水の淡水補給水の相当部分が、これらの地域で最も安定した水源である都市下水の高次処理水でまかなわれるようになっている。(16)	
9	そのまま、あるいは原料として利用可能な廃棄物、屑等にかんするデータバンク、交換・取引所が国、自治体、公益団体等によって広域的に設けられ、相当の役割を果たすようになる。(20)	
10	家畜の糞尿の集中処理がふえ、メタン発酵、焼却などによるエネルギー回収がすすむとともに、肥料化、とくに微生物利用で飼料として利用が大幅にふえる。(24)	
11	工業原料作物の廃棄物、残渣（バガス、麻、パイナップルくずなど）のセルロースを処理したものを栄養として菌体、たん白などを大量生産し、濃厚飼料とする技術の実用化。(28)	
12	低級魚肉、鱗、尾、内臓等これまですてていた、公害源だった未利用たん白を固定化酵素やプラスティン反応などで無味、無色、無臭、アミノ酸組成のすぐれたたん白とし、加工肉の原料とする。(32)	
13	わが国にとって貴重な木材資源を製材やパルプだけでなく、また従来のように燃料や肥料にするのではなく、付加価値の高い炭水化物や高級建材の原料としてできるだけ有効に使うようになる。(36)	
14	関東臨海、近畿臨海、北九州などの水不足地帯では、工業用水コストが、電力料金よりも高くなり、回収再利用の技術水準を高めねばならなくなる。(40)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. A large fraction of the olefins required by the petrochemical industry will be supplied by the cracking of heavy oil residuals such as asphalt and pitch
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) 期待度 (%)	(5) 実現確率	(6) 促進・抑制条件	コ メ ン ト (7)
89.8	0.72	(9) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (10)	(材)装置用耐蝕材料、熱媒体（砂、コークス、粉など）、触媒、水蒸気。(機)分解塔、ポンプ、コンプレッサ。重質油分解の開発ではわが国も先進国である。(11)
98.7	0.73	(13) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (14)	(材)液体窒素。(機)乾燥装置、熱分解装置、粉砕装置(凍結法など)、分離装置、ホッパ、タンク。カーボンブラック、ゴム粒子、燃料油、熱エネルギーなどとして回収。(15)
95.9	0.75	(17) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (18)	(材)逆浸透膜、イオン交換樹脂、活性炭、オゾン、脱窒・脱りんバクテリア、液体窒素、耐蝕性構造材。(機)活性炭吸着槽、透析装置、逆浸透装置、オゾン殺菌装置、脱窒・脱りん装置、凍結法排水浄化装置。ダムなどの水源開発費の上昇と高次処理コスト低下のかね合い。(19)
78.7	0.70	(21) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (22)	(機)通信端末装置、コンピュータ。②くず・廃棄物データバンク、くず・廃棄物取引交換所、情報・通信システム、くず・廃棄物の標準化規格化。(23)
82.4	0.73	(25) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (26)	(材)高効率バクテリアの探索・改良、耐蝕構造材（ステンレス、FRPなど）、包装材。(機)発酵槽、コンポスト化装置、スラッジ焼却熱回収システム、ガスタンク、包装機械。(27)
86.3	0.72	(29) ⊕研究開発陣の努力 ⊖費用・投資の額・規模 (30)	(材)固定化酵素（セルロース分解酵素）、たん白生産用適合菌の探索・育種・培養。(機)耐蝕性パイプ、生化学センサ、各種センサ。(機)細片切断機、粉砕機、すりつぶし機、発酵槽、耐薬品性ポンプ、培養槽、コンピュータ、計測制御システム。技術的には前処理、予備処理が問題点。(31)
82.0	0.69	(33) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (34)	(材)固定化酵素、調味料、フレーバー。(機)魚体すりつぶし機、生化学反応装置、乾燥機、粉砕機、人工肉製造機(退臭調味、組織化用)。たん白質分解酵素の探索、改良、生産と複雑な生化学反応の制御が決め手。(35)
73.5	0.70	(37) ⊕産業・企業の努力 ⊕研究開発陣の努力 (38)	(材)接着剤、結合剤、セルロース分解酵素（固定化酵素）、酵母菌、耐蝕構造材。(機)パイプ。(機)細片切断機、粉砕機、発酵槽、ポンプ、高圧圧縮プレス。高温高圧をかけて建材にしたり、加水分解、醗酵法などで糖やエタノールにする。(39)
68.2	0.68	(41) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (42)	(材)スライムコントロール薬剤の開発・改良、活性炭、イオン交換樹脂、逆浸透膜、耐蝕構造材。(機)逆浸透膜モジュール、イオン交換膜、耐蝕パイプ。(機)活性炭吸着装置、透析装置、逆浸透装置、脱窒・脱りん装置、ポンプ。(43)

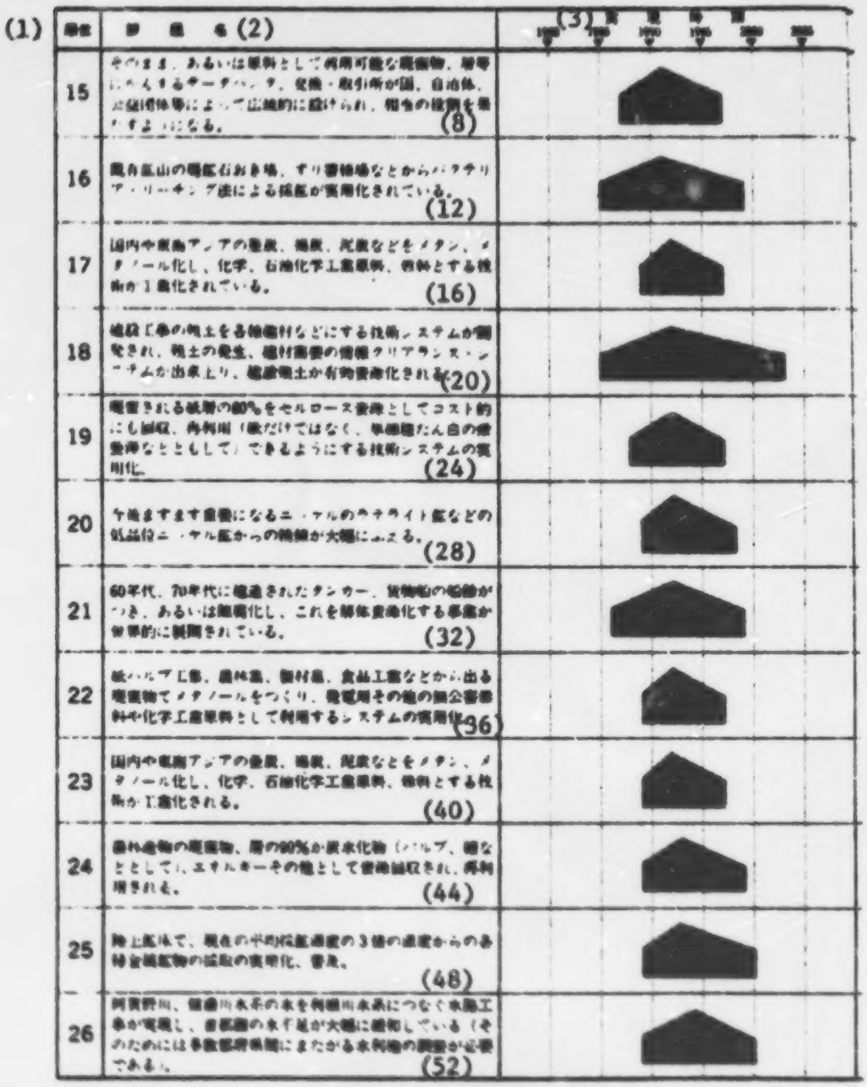
11. (M) corrosion resistant material for facilities, heat medium (sand, coke, powder), catalysts, steam
    (E) decomposition tower, pump, compressor. Japan is a leading country in the development of heavy oil cracking
12. Advances in urban trash collection, transport, and treatment technology and rise in price of resources will enable removal of polymeric materials such as discarded tires and waste plastic from urban waste and reduce them to raw materials and fuel to enable a higher level of recycling than what is presently practiced
13. (+) industry and firm efforts
14. (-) costs, investment, scale

[Key continued on following page]

15. (M) liquid nitrogen
(E) dry distillation equipment, thermolysis equipment, crushing device (pulverizer), separator, hopper, tank. Recovery as carbon black, rubber particles, fuel oil, thermal energy
16. A large fraction of the fresh water for industrial use in the coastal industrial belts of Kanto, Kinki, and northern Kyushu will be obtained by high order treatment of the most reliable water source in the form of sewer water
17. (+) organizational role of administration
18. (-) costs, investment, scale
19. (M) reverse osmosis membrane, ion exchange resin, activated carbon, ozone, denitrifying and dephosphylating bacteria, liquid nitrogen, corrosion resistant structural material
(E) activated carbon adsorption tank, dialysis apparatus, reverse osmosis facility, ozone generator, denitrifying and dephosphylating facility, lyophilizer. Rise in cost of dams for water reservoirs go hand in hand with high water treatment cost
20. Data banks and exchange sites where waste materials and scraps which can be reused as is or can be used as raw materials will be located throughout the country, self-governing organs, and profit-making groups
21. (+) organizational role of administration
22. (-) costs, investment, scale
23. (E) telecommunications terminals, computers
(Sys) scrap and waste data bank, scrap and waste collection and exchange site, information and communication system, standardization and specification of scrap and waste materials
24. There will be increased collection and treatment of domestic animal excrements to be used in methane production and for incineration to recover energy. The use as fertilizer and as feed as the result of microbiological action will increase greatly
25. (+) organizational role of administration
26. (-) costs, investment, scale
27. (M) search and improvement of high efficiency bacteria, corrosion resistant construction material (stainless steel, FRP), packaging material
(E) fermentation vat, compositing facility, sludge incineration heat recovery system, gas tank, packaging machine
28. Technology to utilize waste products of industrial processes using plant material (such as bagasse, hemp, pineapple) scrap in which the cellulose is treated to produce large quantities of bacteria and protein to be used as feed will become practical
29. (+) research and development establishment efforts
30. (-) costs, investment, scale
31. (M) fixed enzyme (cellulose decomposition enzyme); search, culture, and propagation of protein forming bacteria
(C) corrosion resistant pipe, biochemical sensor, various sensors
(E) small sectioning machine, pulverizer, grinder, fermentation vat, chemical resistant pump, culture vat, computer, measurement and control system. The pretreatment and auxiliary treatments present technological problems
32. Low grade flesh, heads, tails, and internal organs which had been discarded in the past and which had been pollution causing items will be rendered tasteless, colorless, and odorless amino acid composition containing protein which will be used as raw material for processed meat

[Key continued on following page]

33. (+) industry and firm efforts
34. (-) costs, investment, scale
35. (M) fixed enzyme, seasoning, flavor
(E) fish paste grinding machine, biochemical reaction facility, dryer, pulverizer, artificial meat making machine (for mixing, flavoring and texturizing). Search, development, and production of protein decomposing enzyme and control of complex biochemical reactions are restrictive factors
36. The valuable wood resource of Japan will be used not only to extract lumber and pulp but will not be used as fuel and fertilizer as was the case in the past but effectively used to produce hydrocarbons and building materials of high additive value
37. (+) industry and firm efforts
38. (+) research and development establishment efforts
39. (M) adhesive, bonding agent, cellulose decomposing enzyme (fixed enzyme), yeast, corrosion resistant building material
(C) pipe
(E) small slicer, pulverizer, fermentation vat, pump, high pressure compression press. High pressure press will be used to produce formed material or hydrolysis or enzymes will be employed to produce sugars or methanol
40. The cost of industrial water in the water deficient industrial coastal belts of Kanto, Kinki, and northern Kyushu will become higher than the cost of electricity, and water recovery and reutilization technology has to be raised to higher levels
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) development and improvement of slime control agents, activated carbon, ion exchange resins, reverse osmosis membrane, corrosion resistant building material
(C) reverse osmosis membrane module, ion exchange membrane, corrosion resistant pipe
(E) activated carbon adsorption facility, dialysis facility, reverse osmosis facility, denitrifying and dephosphylating facility, pump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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Data banks, exchange, and handling sites will be established by the national government, local governments, and nonprofit groups throughout the country to handle wastes and scraps which can be used as is or as raw material. Considerable effect can be expected
9. (+) organizational role of administration
10. (-) costs, investment, scale

(4) [illegible] %	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
70.8	0.67	(9) [illegible] (10)	[illegible] (11)
62.2	0.63	(13) [illegible] (14)	[illegible] (15)
86.3	0.71	(17) [illegible] (18)	[illegible] (19)
57.8	0.63	(21) [illegible] (22)	[illegible] (23)
86.5	0.71	(25) [illegible] (26)	[illegible] (27)
93.8	0.71	(29) [illegible] (30)	[illegible] (31)
80.0	0.71	(33) [illegible] (34)	[illegible] (35)
84.0	0.68	(37) [illegible] (38)	[illegible] (39)
86.3	0.71	(41) [illegible] (42)	[illegible] (43)
80.3	0.67	(45) [illegible] (46)	[illegible] (47)
73.6	0.67	(49) [illegible] (50)	[illegible] (51)
75.5	0.66	(53) [illegible] (54)	[illegible] (55)

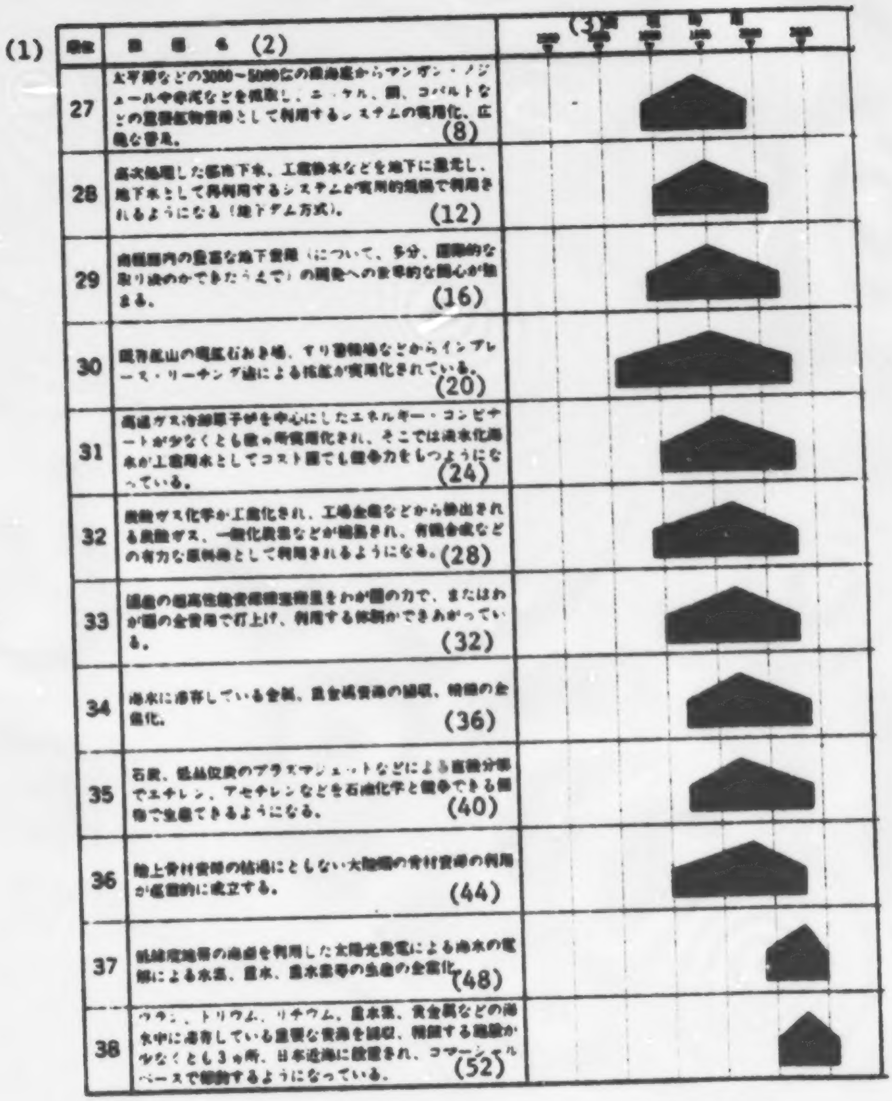
11. (E) telecommunications terminals, computers
    (Sys) scrap and waste data bank, scrap and waste handling station, information and communication system to standardize waste handling. This is being conducted in West Germany on considerable scale, and there is already a small scale system in Japan
12. Bacteria leaching of waste ores and mine tailings to recover valuable minerals will become practical
13. (+) research and development establishment efforts
14. (-) costs, investment, scale
15. (M) search and propagation of suitable bacteria
    (C) corrosion resistant pipe, corrosion resistant conduits, corrosion resistant tank
    (E) corrosion resistant pump
    (Sys) system measurement
    (Ser) mineral prospecting. Research and development on uranium, copper, and oil sand under way

[Key continued on following page]

16. Domestic and Southeast Asian lignite, brown coal, and peat will be converted to methane and methanol to serve as raw materials for chemistry and petrochemistry as well as fuel using technology being developed
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) catalysts
    (E) pulverizer, methane reaction tower, methanol reaction tower, heat exchanger, liquefaction apparatus, tank
20. Technology to utilize dirt left over from construction as construction material will be developed, a clearance system to handle information on the generation of such dirt and construction demand will be established, and left over dirt from construction will be utilized effectively
21. (+) research and development establishment efforts
22. (-) costs, investment, scale
23. (M) cement to convert clay to concrete, bonding agent
    (E) various ceramic kilns, forming equipment, terminal communication device, computer
    (B) construction projects, construction information data bank system, data bank for information on technology for effective utilization of leftover dirt from construction. The maximum load that can be handled by large capacity trucks throughout the country is residual construction dirt
24. Technology will be made practical to recover at least 80 percent of scrap paper discarded as raw material for cellulose production that will be costwise and reutility-wise effective (not only to make paper but to culture single cell protein)
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) celase (cellulose decomposing enzyme)
    (C) biochemical sensor, chemical sensor
    (E) small slicer, ink removal device, dehydrating device, fermentation vat, pump, computer, measurement and control facility. A ton of paper scrap will yield 600 kg sugar and 300 kg molasses by enzyme decomposition
28. Refining of nickel from low grade laterite ore which heretofore has not been utilized will be conducted on large scale
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (M) reducing agent (coke, charcoal), halogenating agent (NaCl, etc.), surfactant, extraction agent (ammonia, etc.), reducing agent (CO_2, H_2, gas)
    (E) pulverizer, pelletizer, reduction apparatus, extraction tank, filter device (separate filtration), electrolytic cell, sintering furnace
    (Sys) segregation method, ammonia extraction method
32. Tankers and freighters built in the 60's and 70's will have aged or deteriorated, and an industry to scrap and dismantle these ships will be developed worldwide
33. (+) industry and firm efforts
34. (-) costs, investment, scale
35. (E) operation ship, high performance flame cutter, high performance underwater welder, water jet cutter, various cranes, dismantling dock
36. Wastes from the paper pulp industry, farming, lumber industry, and food industry will be utilized to make methanol which will be used as raw material for power generation as nonpolluting fuel in the system to be developed

[Key continued on following page]

37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (M) corrosion resistant construction material, catalyst
    (C) pipe
    (E) fine slicer, pulverizer, high temperature and pressure methanol reaction tower, pump, tank
40. Domestic and Southeast Asian lignite, brown coal, and peat will be converted to methane and methanol by commercial technology for use as raw material for chemical industry and fuel
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) catalysts
    (C) pipes
    (E) pulverizer, high temperature and pressure methane reaction tower, high temperature and pressure methanol conversion reaction tower, pump, compressor, tank. Methanol is nonpolluting. It is a good fuel, is readily transported and stored, and its lowered cost will enable large volume use
44. At least 90 percent of forest product waste and scrap will be converted to carbohydrates (pulp, sugar, etc.) for recovery as energy and other resources for reutilization
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (M) celase (cellulose decomposing enzyme), search and propagation of SCP forming bacteria, corrosion resistant material
    (C) biochemical sensor, corrosion resistant pipe
    (E) fine chopper, pumping facility, fermentation vat, methanol production facility, pump, computer, measurement and control facility, heat recovery type incineration furnace, boiler, turbine generator
48. Various ores will be mined from land based mines at depths three times the average depth of today's mines
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (M) heat resistant and super heat resistant construction materials, heat medium
    (C) heat resistant and super heat resistant pipe, heat pipe, gas, dust sensor
    (E) heat resistant and super heat resistant mining equipment, heat exchanger, pump, high performance heat pump, large capacity freezer, mining robot
    (B) super deep level mines
    (Sys) super deep level drilling method, safety system
    (Ser) mineral prospecting
52. A water system linking the Agano and Shinno rivers to Tone River will be completed to greatly relax the water insufficiency of the prefectures and cities (a water rights system covering several cities and prefectures will be required)
53. (+) political organizational role
54. (-) costs, investment, scale
55. (C) large diameter steel pipe
    (E) large engineering machinery, large capacity pump, hydropower turbine generator, computer, unmanned operating system
    (B) waterway construction project (pump station controlled system), raised water power plant
    (Sys) coordination of wide area water rights. The volume of water in the Shinno and Agano rivers is greater than that of the Tone River, and these can be joined by about 100 km of waterway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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Manganese nodules and Akadoro [literally red mud] will be recovered at 3,000-5,000 meter ocean depths in the Pacific Ocean to utilize important mineral resources for nickel, copper, and cobalt will become practical and widely used
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	(7) コメント
98.6	0.73	(9) [illegible] (10)	[illegible] (11)
51.1	0.38	(13) [illegible] (14)	[illegible] (15)
72.5	0.67	(17) [illegible] (18)	[illegible] (19)
64.3	0.66	(21) [illegible] (22)	[illegible] (23)
70.2	0.69	(25) [illegible] (26)	[illegible] TA. (27)
86.1	0.68	(29) [illegible] (30)	[illegible] (31)
48.5	0.40	(33) [illegible] (34)	[illegible] (35)
82.2	0.69	(37) [illegible] (38)	[illegible] (39)
68.1	0.66	(41) [illegible] (42)	[illegible] (43)
47.1	0.62	(45) [illegible] (46)	[illegible] TA. [illegible] (47)
64.8	0.60	(49) [illegible] (50)	[illegible] (51)
80.0	0.65	(53) [illegible] (54)	[illegible] TA. [illegible] (55)

11. (M) sea water resistant high tensile strength steel, sea water resistant abrasion resistant steel
(C) large diameter flexible hose, bucket, chain
(E) forced air lifter, dynamic positioner, computer, marine meteorological measurement system. Heat resistant material, nickel which is indispensable to strength materials, and particularly important as cobalt source. Large possibility for commercialization.
12. City sewage and industrial waste water will be reduced underground after high level treatment and reutilized as underground water in a reutilization system that will be made practical (underground dam mode)
13. (+) political organizational role
14. (-) costs, investment, scale

[Key continued on following page]

15. (M) activated carbon, ion exchange resin, reverse osmosis membrane, corrosion resistant construction material
(C) corrosion resistant pipe, reverse osmosis membrane module, ion exchange membrane
(E) activated carbon adsorption facility, pump, dialysis apparatus, reverse osmosis facility
(B) underground dams
(Sys) survey of cleansing power of soil microorganisms
(Ser) geologic survey, hydrologic and hydraulic survey
Cleansing power of soil and the underground, cooling property, and storage capability will be exploited.
16. Worldwide interest will develop on utilization of abundant mineral resources under the Antarctic cap (international handling will probably be required)
17. (+) political organizational role
18. (-) costs, investment, scale
19. (M) low temperature resistant construction material
(C) sensors
(E) resources prospecting machine, aircraft, resources survey satellite, test drilling machines
(Sys) low temperature resistant equipment system, remote sensing system
There must be international handling of world peace and tranquility.
20. In place leaching method will become practical to conduct in place leaching of minerals from the tailings and dregs of existing mines
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (M) suitable catalysts, solvents, corrosion resistant construction material
(C) corrosion resistant pipe, corrosion resistant conduit, corrosion resistant tank
(E) corrosion resistant pump
(Sys) system design
(Ser) mineral prospecting
24. Several energy complexes centered on high temperature gas reactors will be deployed and desalinated water will be produced at competitive cost for industrial use
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) titanium metal, copper-nickel, heat resistant sea water aluminum alloy, reverse osmosis membrane, ion exchange resin, pretreatment chemicals
(C) heat resistant sea water pipe (steam pipe), reverse osmosis module, ion exchange membrane
(E) condensation drum, heat exchanger, tank, pump
(Ser) environmental assessment, TA
28. Carbon dioxide gas chemistry will become industrialized, carbon dioxide and carbon monoxide discharged from plants will be collected, and they will be utilized effectively as raw material for organic synthesis
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (E) waste gas collecting facility, CO_2-CO separating and concentration facility, reaction tower, tank
(Ser) basic scientific research. The foundation for CO and CO_2 chemistry is being established in Japan at the present time.

[Key continued on following page]

32. A purely domestically developed super high performance resources prospecting satellite will be launched totally at this nation's expense, and the system to utilize this satellite will be established
33. (+) research and development establishment efforts
34. (-) costs, investment, scale
35. (M) super high specific strength building material, high specific thrust rocket fuel
(C) various sensors
(E) launching rocket, artificial satellite, computer, communication control system, automated control system, high performance data recorder
(Sys) data analysis system, remote sensing system
36. Recovery and refining of metals and heavy metals dissolved in sea water will become practical
37. (+) industry and firm efforts
38. (-) costs, investment, scale
39. (M) adsorbant, ion exchange resin, reverse osmosis membrane, metal chelate resin, solvent, sea water resistant steel, sea water resistant building material (such as FRP), sea water resistant concrete, sea water resistant mortar
(E) dialysis apparatus, adsorption apparatus, reverse osmosis apparatus, desorption apparatus, dissolution and elution tank
(B) tide utilization recovery station
40. Low grade coal and coal will be directly decomposed by plasma jet to produce ethylene and ethylene type gases at a rate competitive with petrochemistry
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (E) plasma jet torch, decomposition reaction tower, decomposition apparatus, pulverizer, tank, pump, compressor, measurement system
44. Establish industry to utilize continental shelf resources as resources on land diminish
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (M) sea water resistant steel
(E) undersea bulldozer, dredger, separator, washer, hopper, belt conveyer
(Ser) environmental assessment, TA
World's Fair, Olympics, and Okinawa Ocean Exposition all imported gravel from Korea and Taiwan. This should serve as comparison
48. Industrialization of hydrogen, heavy water, and deuterium production by the electrolysis of sea water using power generated by solar energy at the low latitude zones
49. (+) research and development establishment efforts
50. (-) costs, investment, scale
51. (M) sea water resistant construction material, silicon ribbon, compound semiconductor ribbon, electrode, flotation material
(C) sea water resistant selective permeable membrane cover
(E) large flotation type marine raft, large submersible type operating stand shop, marine meteorological observation system, computer, electrolysis cell, automated float-sink device
(Ser) environmental assessment

[Key continued on following page]

52. At least three sites for the recovery and refining of uranium, thorium, lithium, deuterium, and noble metals will be established along the seas off Japan and will be operated on a commercial basis
53. (+) industry and firm efforts
54. (-) costs, investment, scale
55. (M) high performance adsorbant, ion exchange resin, chelating resin, sea water resistant construction material, solvent, catalyst, sea water resistant concrete, sea water resistant mortar
(B) tidal resources recovery station
(Ser) environmental assessment, TA
There is 4 billion tons of uranium dissolved in sea water. A marine chemical industry may be the trump card for resources poor Japan.

2267
CSO: 8129/1906

PROMOTE DIVERSE PRODUCT, SMALL VOLUME PRODUCTION THROUGH PROMOTION OF MANPOWER AND MACHINE DIVISION OF LABOR

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 58-65

[Article by Tamonobu Suganuma]

[Text] Industrial Production

"Humanizing the Work Environment"

Japan's manufacturing industry arose from the ashes of defeat in war and is a pillar which supports Japan as the second in the free world where economic level is concerned.

Japan has prospered thus far through the production of middle class and commonly used materials and equipment which are greatly in demand throughout the world. The Japanese manufacturing industry which has been able to produce goods to compete on a price and price unrelated competition is today still in a position to have to arduously retain its highly competitive strength.

At the same time, environmental problems, energy, and resources problems have directly confronted this situation while the middle class goods whose production was the basis of its prosperity in the past are now being produced by the many partially advanced countries such as Korea, Taiwan, Singapore, Spain, Brazil, and India in a so-called "boomerang effect." It has become imperative that the Japanese manufacturing industry gradually raise the level of its product mix.

Now, what will the Japanese manufacturing industry be 10 or 15 years from now? The "Predictions of Technological and Industrial Structure '78" put out by the Industrial Materials Research Institute pictures the following situation.

In the 1990 decade this country will find its industrial structure on a higher level tied in to efforts for greater knowledge intensity and the products manufactured will be of considerably higher levels than at present. On the other hand, a large fraction of the raw materials, energy, and food will have to be imported. In exchange, Japan will supply materials, chemical products, manufactured products, machinery, and services which the rest of the world needs.

If this type of industrial foundation is to be maintained, there will have to be the continued high level export competitive strength and efforts at its reinforcement. This will probably have to be attained by advancing into overseas areas and striving to internationalize firms. At the same time, where domestic siting is concerned, material industries will site plants on artificial sites created on the sea or on remote areas in the form of compact plants with high versatility, product inspection and control process, and with high on line real time. The fabrication industries will standardize and introduce specifications to come up to the levels of the United States and West Germany and follow a course of diverse product small volume production of goods very much in demand. The assembly industries will probably take up a comprehensive order entry system incorporating receipt of order, design, production, and sale for mass produced and non-mass produced machines. Where large machines are involved such as aircraft, ships, and plants, simulation technology employing high level CAD and holographic 3D models will probably be adopted.

Next, not only work that has to be performed in a hazardous environment but work of a monotonous nature will be mechanized to the extreme, and the boundary between what man will do and what machines will do, in other words, the rational division of labor relationship between man and machine, will be made fairly clear. A worker must be given incentive in his working environment toward humanizing such as demanding he strive toward creative efforts.

Responding to Higher Level Needs

As the 1990 decade is entered, the needs of the domestic and foreign markets for Japan's base industrial products will become of considerably higher level and of more varied array. In order to respond to this situation, it will be necessary to bring materials, processes, and machine facilities in line with diverse product small volume production at reasonable cost. The course Japan will have to follow probably will be material production through compact plants and flexible multipurpose and multiobjective plants which employ intelligent robots, group technology, and high class assembly line for assembly of products through order entry system or CAM system (unmanned plant).

It will not be possible to continue the practice of the past in which raw materials from the export markets all around the world, resources such as energy, and food were imported at the greatest rate of any country while only small quantities of finished goods were imported. There is need to shift gradually to promote conservation of resources and conservation of energy first with the base industries and particularly material and fabrication industries.

This direction will entail great hardships and may not be simply attained, but it is in line with a knowledge intensive, higher level industrial structure. It is the direction to maintain and strengthen Japan's economic and industrial bargaining power.

The 1990's will probably require not only the base industries and the heavy chemical industries but the number of industrial areas which supplement, correlate, or lie peripheral while depending on the technology and structure and raise the productivity to high level through the proper preparations, assistance, and various followup processes.

Remote unmanned control CAM mode will probably be commonplace in both mechanical and process plants, and self-repair, automated inspection, and automated damaged part replacement will be widely used for common malfunctions. At the same time, a high degree of automated plant protection and safety systems will probably be extended to a wide degree. It will probably be possible that processes such as casting and welding will be automated and performed unmanned in a manner similar to today's plastic fabrication and cutting.

Finally, the principal products of this country's industry will become middle class to high class goods both along the capital goods and the durable consumer goods lines, possess high performance, and require little maintenance. At the same time, the specifications on the quality of materials and precision of fabrication going into the products will become more demanding.

To this end plasma jet furnaces, electron beam furnace, and large vacuum melting furnaces type high quality material production facilities and high melting point alloys, superprecision cast products, and nonsegregating large steel ingots, and large single-crystal new ceramics may become commonplace.

The technological subjects that have to be developed to assure the capacity to respond to the domestic and foreign needs to make Japan competitive on an international scale in the area of industrial production are:

1) Developmental subjects related to strengthening export competitive power, 2) developmental subjects related to humanizing the labor environment, 3) developmental subjects related to responding to diverse needs and to raising to higher levels products and materials, 4) developmental subjects related to attaining high productivity, and 5) developmental subjects related to conservation of resources and energy

Increasing Multiemployment Capability, Multioccupationalization

We now will use the results of the technological predictions that were compiled and look at the timewise emergence of the technologic development subjects corresponding to the aforementioned five policies.

The first is the enhancement of export competitive strength and the associated developmental subjects. The period of 1986-1990 will see the maximum mechanization and automation in the fabrication and assembly processes of materials, parts, and units for which mass production and low cost are required. In an ordinary process the replacement of a man by a machine in terms of the 1975 constant price is within 15 million yen for most situations. Processes where there is element of danger, monotony, or toxicity will cost more, but they too will be mechanized, automated, and unmanned, and the division between man and machine will become that much more clearly defined. The standardization and specifications on machines and their parts, materials, and fabrication are expected to come to the levels of the United States and West Germany, the competitive strength of machines and plants is expected to increase greatly, and the automated production line will probably incorporate machines with self-repair capability.

The 1991-1995 period will probably see the commonplace operation of large plants necessary to bring about benefits of scale and complex [industrial park] effect on artificial islands created at sea, and compact steelmaking plants with high degree of computer control will become industrialized.

The 2001-2005 period will probably see the assembly of large ships and piers by a joining process.

In the area of humanization of the working environment, the 5 years of 1981-1985 will see the adoption of a research and proposal system for improving the production process of the worker and made very general. The Reynaud's syndrome caused by highly vibrating machines will be completely removed by the introduction of self-operating machines.

The 5 years between 1986-1990 will see the differentiation between man and machine become more clearly defined, and man will begin to do work that is more befitting a man. The multiwork capability and multiwork (multijob nature) of this work will become more general and also be encouraged. Work in harmful environment will be performed in unmanned manner, the work will be enclosed in a capsule while the worker will observe from the outside. Many layers of fail-safe mechanisms will be used for hazardous work.

Appearance of Robots With "Eyes"

In the area of technological developmental subjects responding to the multiple nature of needs, the 1986-1990 period will probably see the appearance of mini mill type multipurpose plant types in the materials, production, and chemical industries and small turnover and circulation will become commonplace. Assembly automation will become highly developed, and automated assembly machines with learning capabilities, intelligent robots and robots with pattern recognition capabilities, and assembly modes with group control capability not requiring assembly line switchover will be developed and refined. It will be possible to perform group control of automated fabrication lines with the capability of executing a number of different processing methods of various types while the large scale high melting point refining of metals with plasma jets and electron beams will become greatly advanced.

The period between 1991 and 1995 will see the need for technology to manufacture massive high purity steel ingots (macrosegregation free steel ingots) through zone refining.

The production of superhigh precision case products with tolerance of ± 0.02 mm will become practical in 1996-2000.

Space factories for producing superhigh purity metals, (perfect transition?) metals, and giant single crystal metals will probably become practical at low cost on large artificial satellites in 2001-2005.

The technological developmental subjects related to the emergence of high productivity will probably see completely automated welding facilities, casting process of the same level or higher to the present rolling process, and facilities diagnostic technology system which discovers malfunctions and their causes before they happen to become practical in the 1986-1990 period. Intelligent robots with multiple capabilities for different applications will be used which will have eyes and use this sight to keep a process going in a completely unmanned manner which will be developed and made practical.

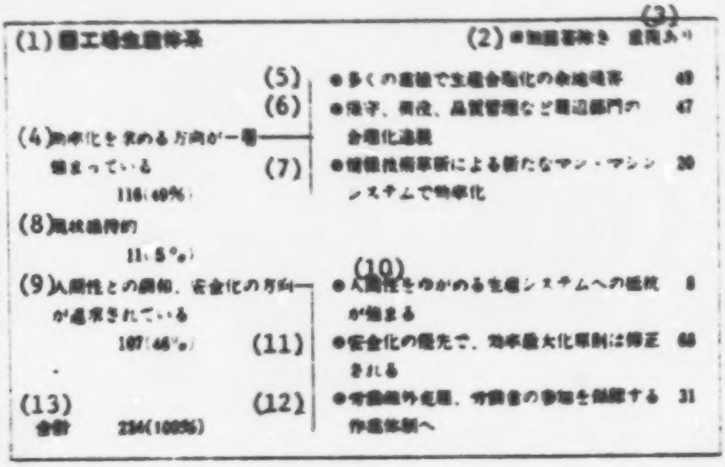
The technological developmental subjects in the area of resources conservation and energy conservation will be associated with the industrialization of technology for continuous production of steel materials from molten steel, the use of giant vats and towers for energy conservation, and technology on corrosion resistant lining for resources conservation which are expected to become practical in the 5 years between 1986 and 1990.

The 1991-1995 period is expected to see coke production technology from noncaking coal, direct electrolytic technology for nonferrous sulfides, superhigh pressure plastic fabrication technology for the production of superhard and superbrittle new ceramics, and production technology for diverse small volume metal products through powder rolling and powder extrusion become industrialized.

Direct reduction of aluminum utilizing nuclear reactor heat, direct reduction of titanium metal from titanium oxide, direct reduction to metals from high melting point metal oxides, and continuous production of steel products from molten steel in unmanned plants will probably make their appearance in 1996-2000.

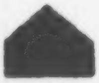
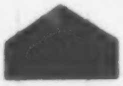
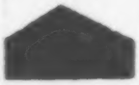
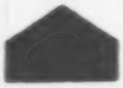
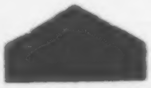
It is expected that cheap corrosion resistant steel with one atom layer plating of noble metal to be used in undersea construction will become practical by 2001-2005.

All the developmental subjects discussed above have shown advanced industrialization and have been developed to the stage that widespread diffusion is beginning to take place. While there are differences according to themes, roughly 10-15 years lead times should be allowed preceding the actual development.



Key:

1. Plant production system
2. Excluding non-respondents
3. Duplications included
4. Directions to obtain efficiency are actively reinforced
5. There remain much room for production rationalization in many types of industries
6. Promote rationalization of peripheral areas such as maintenance, cargo handling, and quality control
7. More efficient operation from new man-machine system brought about by information technology innovation
8. Presently maintainable
9. Harmony with humanness and direction to safety are pursued
10. Resistance to systems which twist humanness is strengthened
11. Safety predominates, and the principle of maximizing efficiency is modified
12. To a work system which overcomes work indifference and assures worker participation
13. Total

順位 (1)	課題名 (2)	(3) 実現時期 1980 1985 1990 1995 2000 2005
	(8) **輸出競争力の強化**	
1	量産化とそれによるコストの引下げを必要とする材料、部品、ユニットなどの加工、組立て工程の最大限の自動化、無人化。 (9)	
2	機械、部品、プラントなどの標準化、規格化が国家的段階から作業現場まで一貫し、かつ米国、西独などの水準まで全般的水準が上がり、わが国の機械、プラント類の国際競争力が大幅に上がっている。 (13)	
3	染色、整理から仕上げまで各種加工工程を一貫して自動化するシステムが支配的になる。 (17)	
4	労働者1人を機械におきかえるのに必要な設備投資額が昭和50年不変価格で1500万円以上でも、輸出競争力保持のために必要な作業工程はほとんど機械化、自動化、無人化される。 (21)	
5	労働者1人と機械をおきかえるのに必要な設備投資が昭和50年不変価格で1500万円以内の生産工程はほとんど機械化、自動化、無人化される。 (25)	

Key:

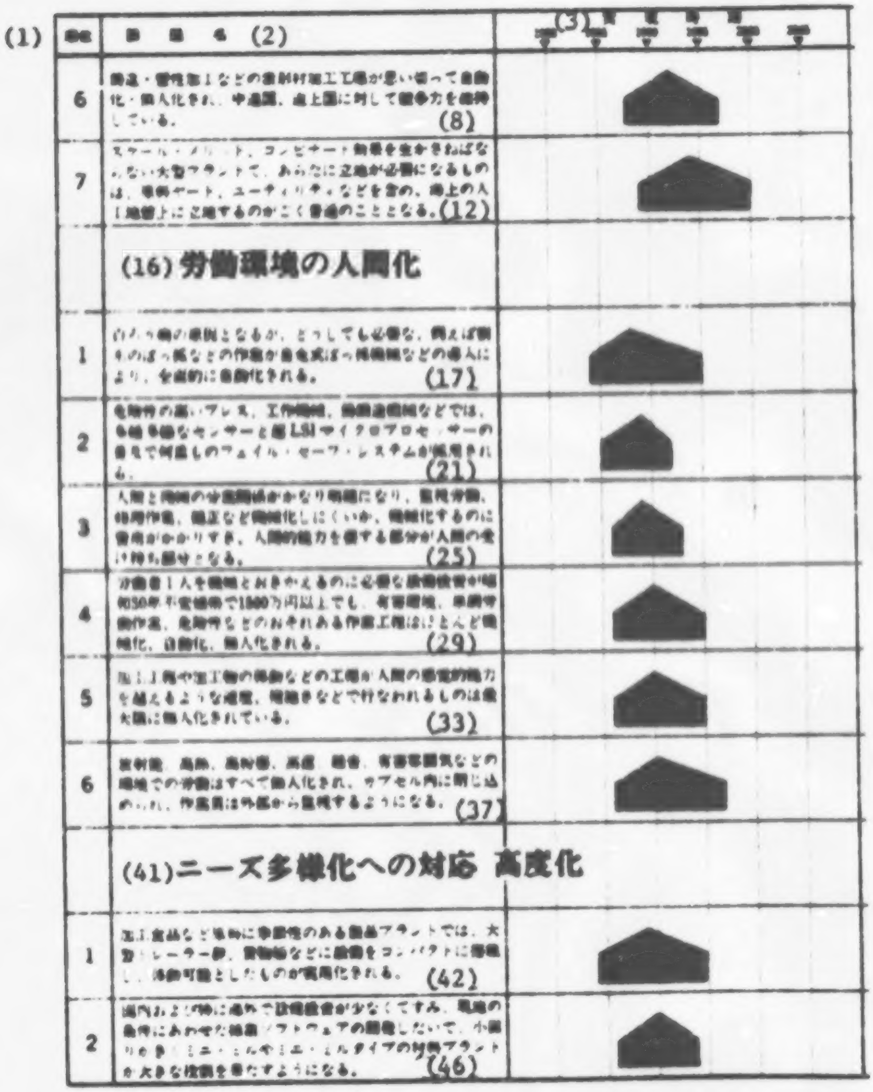
1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Strengthening export competitive strength
9. Mass production and maximum degree of automation and unmanned operation of the fabrication and assembly processes of materials, parts, and units necessary to lower cost
10. (+) industry and firm efforts
11. (-) costs, investment, scale
12. (C) pressure sensor, light sensor
    (E) automated assembly machine, transport robot, automated fabrication machine, automated metal finishing machine, automated plastic forming machine, automated casting machine, transport facility, automated control system, automated measurement equipment
13. Standardization and specification of machines, parts, and plants become adopted from the national scale to the industrial plants, the overall level approaches that of the United States and West Germany, and the international competitive strength of Japan's machines and plants is greatly increased

(4) 重要度 (%)	(5) 実現確率	(6) 促進・制約条件	コ メ ン ト (7)
98.3	0.73	(10) (+)産業・企業の努力 (−)費用・投資の額・規模 (11)	Ⓒ圧力センサ、光センサ。Ⓔ自動組立機械、搬送ロボット、自動工作機械、自動金属加工機、自動プラスチック成型機械、自動鋳造型機械、搬送装置、自動制御システム、自動計測機器。 (12)
91.2	0.72	(14) (+)産業・企業の努力 (−)費用・投資の額・規模 (15)	①標準化・規格化の普遍化、標準化・規格化の高度化、標準・規格のトレーサビリティの確立・高度化。②標準化・規格化コンサルテーション。JISよりも一段と高度な国家的規格の導入が緊急に必要である。 (16)
78.2	0.69	(18) (+)産業・企業の努力 (−)費用・投資の額・規模 (19)	Ⓜ適合染料、適合染色用溶剤、適合染色用エアゾル化剤、適合仕上剤。Ⓒ色およびセンサ、湿度センサ、温度センサ。Ⓔ自動色合せ装置、自動染料調合・調剤装置、非水染色装置、マイクロプロセッサ、ミニコンピュータ。②布地風合等の検知・制御システム。 (20)
96.5	0.74	(22) (+)産業・企業の努力 (−)費用・投資の額・規模 (23)	Ⓒ圧力センサ、光センサ。ⒺNC工作機械、NC金属加工機械、NCプラスチック成型機、荷役ロボット、清掃ロボット、修理・保守ロボット、自動鋳造機械、自動成型機械、搬送装置、加工ロボット、自動制御システム、搬送ロボット、コンピュータ、自動計測機器。 (24)
71.9	0.70	(26) (+)産業・企業の努力 (−)費用・投資の額・規模 (27)	Ⓔ自動工作機械、NC工作機械、自動金属加工機械、自動プラスチック成型機械、自動鋳造機械、自動成型機械、計測機器、搬送装置、自動制御システム。 (28)

14. (++) industry and firm efforts
15. (--) costs, investment, scale
16. (Ser) spread of standardization and specification, high level standardization and specifications
(Sys) standardization and specifications consultation
There is urgent need for introduction of national specifications one step higher than JIS
17. An automated system covering the entire process from dyeing to finishing becomes the overriding process in the textile industry
18. (++) industry and firm efforts
19. (--) costs, investment, scale
20. (M) suitable dyes, suitable dyeing solvent, suitable dyeing aerosol, suitable finishing agent
(C) color sensor, moisture sensor, temperature sensor
(E) automated color mixing machine, automated dye adjustor, preparation facility, nonaqueous dyeing facility, microprocessor, microcomputer
(Sys) sensing and control system to judge fabric quality
21. Even when the cost to replace a laborer with a machine exceeds 15 million yen at constant 1975 prices, the work processes will essentially be all mechanized, automated, and unmanned where necessary to maintain export competitive strength
22. (++) industry and firm efforts
23. (--) costs, investment, scale

[Key continued on following page]

24. (C) pressure sensor, light sensor
    (E) NC fabrication machine, NC metal finishing machine, NC plastic forming machine, loading robot, washing robot, repair and maintenance robot, automated casting machine, automated production machine, transport facility, finishing robot, automated control system, transport robot, computer, automated measurement equipment
25. Almost all of the production processes in which the cost to replace a man by machine is 15 million yen or less by 1975 standards will be mechanized, automated, and unmanned
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (E) automated fabrication machine, NC fabrication machine, automated metal finishing machine, automated plastic forming machine, automated casting machine, automated production machine, transport facility, automated control system


(1)
(2)
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6
(8)
7
(12)
(16) 労働環境の人間化
1
(17)
2
(21)
3
(25)
4
(29)
5
(33)
6
(37)
(41)ニーズ多様化への対応 高度化
1
(42)
2
(46)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Base material finishing processes such as casting and plastic finishing are completely automated and unmanned to maintain competitive strength against partially advanced and advancing countries
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
83.5	0.75	(9) [illegible] (10)	[illegible] (11)
67.9	0.67	(13) [illegible] (14)	[illegible] (15)
87.5	0.71	(18) [illegible] (19)	[illegible] (20)
96.4	0.72	(22) [illegible] (23)	[illegible] (24)
98.3	0.74	(26) [illegible] (27)	[illegible] (28)
94.0	0.70	(30) [illegible] (31)	[illegible] (32)
96.6	0.71	(34) [illegible] (35)	[illegible] (36)
98.5	0.71	(38) [illegible] (39)	[illegible] (40)
75.0	0.70	(43) [illegible] (44)	[illegible] (45)
76.4	0.68	(47) [illegible] (48)	[illegible] (49)

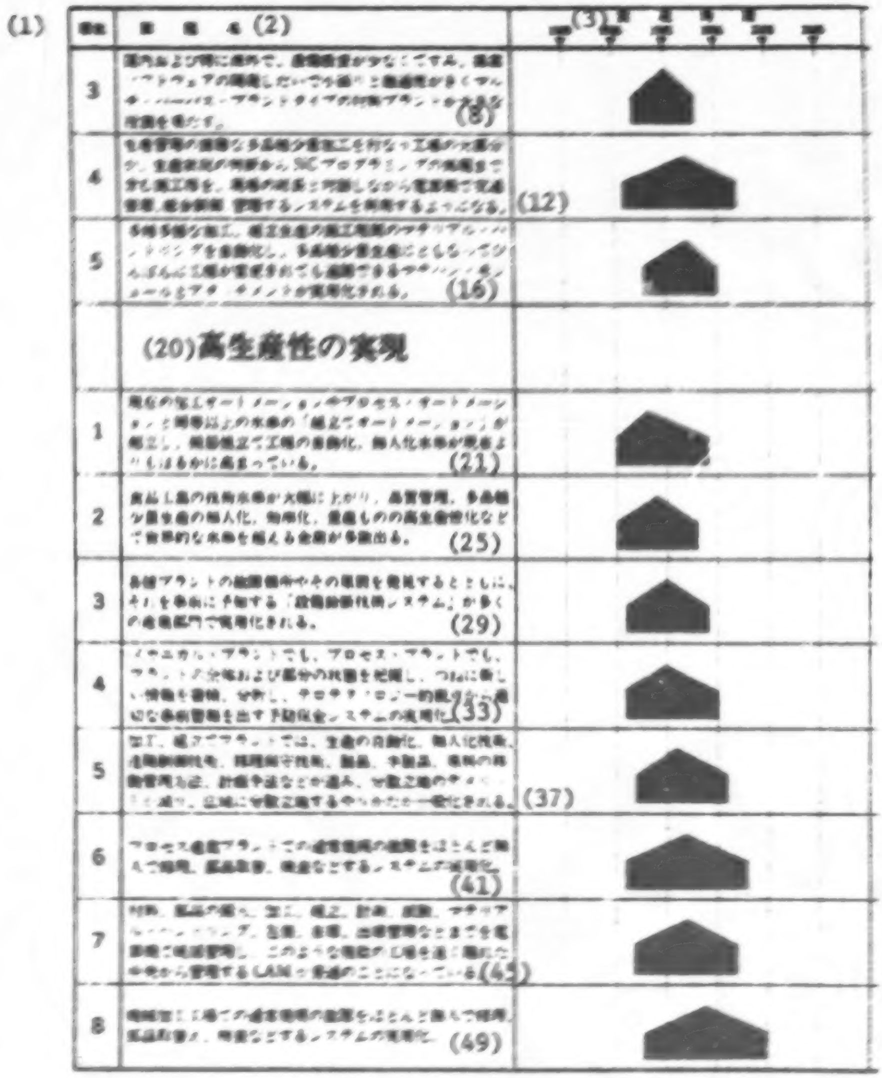
11. (E) high level shaping and forming machines, NC hot water injector, NC group control press, computer, fabrication-load robot, NC transport facility. Japanese machine industry's future will be clouded unless a high level of sophisticated base shaped material finishing technology is developed
12. Large plants necessary to activate the scale merit combinat effect which need to be sited will be commonly placed on artificial foundations at sea and provided with raw material yards and utilities
13. (+) industry and firm efforts
14. (-) costs, investment, scale
15. (M) sea water resistant, weather resistant high tensile strength steel, sea water resistant concrete, sea water resistant mortar, earth foundation reinforcing agent
(C) undersea power cable, floating wave neutralizing pier
(E) automated underwater welder, underwater construction facility
(B) artificial foundation on sea, marine engineering project, marine construction project. Great degree of freedom can be realized from siting limitations enabling considerable recovery of competitive strength

[Key continued on following page]

16. Humanizing Work Environment
17. While a cause of Reynaud's syndrome, necessary operations such as the cutting of trees will be through self-operated machines which will be introduced to completely automate the process
18. (+) research and development establishment efforts
19. (-) costs, investment, scale
20. (C) sensitive pressure sensor, light sensor
    (E) self-running machines, remote control facility, wireless control facility, wire connected control facility. There also are methods involving use of lasers and high pressure hydraulic jet
21. Various sensors and VLSI microprocessors will be freely used to provide fail-safe systems where pressing, fabrication machine operations, and casting machine operations involving high degree of danger are involved
22. (+) industry and firm efforts
23. (-) costs, investment, scale
24. (C) light sensor (photodiode, phototransistor, etc.), pressure sensor, hydraulic equipment, compressed air equipment
    (E) VLSI, microprocessor, automated controller
25. The demarcation between man and machine becomes fairly clearly defined, and man will handle those areas which require observation, repair, and replacement which are difficult to automate, which are too expensive to automate, or require human capabilities
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (Sys) VE research, labor psychology, labor physiology, joint research between economist, labor psychologist, and mechanical engineer
29. Even when it requires 15 million yen or more to replace a man with a machine at 1975 prices, practically all work processes which are conducted in harmful environment, are monotonous, or are dangerous will be mechanized, automated, and unmanned
30. (+) organizational role of administration
31. (-) costs, investment, scale
32. (C) pressure sensor, light sensor
    (E) NC fabrication machine, NC metal finishing machine, NC plastic forming machine, automated casting machine, transport facility, finishing robot, automated control system, transport robot, computer, automated measurement equipment, loading robot, cleaning robot, repair and maintenance robot
33. Those processes such as finishing and movement of products which are performed under speeds and complex manner beyond the capability of human reflexes will be unmanned to the utmost degree
34. (+) industry and firm efforts
35. (-) costs, investment, scale
36. (C) instrumentation equipment, phototransistor, photodiode
    (E) instrumentation and control system, minicomputer, microprocessor, intelligent robot (with sight and touch), pattern recognition facility.
    Electronics, radiation, and ultrasonic, and such modes may be sufficient
37. Work in radioactive, high temperature, high dust, high humidity, noise, and toxic gas environment will all be unmanned, be enclosed in a capsule where the worker can observe from the outside
38. (+) industry and firm efforts
39. (-) costs, investment, scale

[Key continued on following page]

40. (M) radiation shielding material (if possible, transparent), heat and noise shielding material (if possible, transparent)
(C) production equipment capsule (if possible, transparent) and shielding away radiation, toxic vapors, and noise, instruments, sensor
(Sys) instrumentation and control system, minicomputer, microcomputer, equipment air conditioner
41. Response to Multiplicity of Needs, High Level
42. Large trailer groups and freight ships type facilities will be made in compact form for ready moving about for use with food processing plants of seasonal nature
43. (+) industry and firm efforts
44. (-) costs, investment, scale
45. (E) machine and facility system easily reassembled, high performance washing and cleaning system, high performance and compact environmental pollution prevention facility, readily expandable or shrinkable and operatable utility system
(Sys) module system. Crab canning ship will be upgraded, and canning sites will also be placed on land
46. Mini mill and mini mill type material plants of small turnaround which can be developed with just the software necessary to the local situation and which require small capital outlay for facilities will play large roles in Japan and particularly overseas
47. (+) industry and firm efforts
48. (-) costs, investment, scale
49. (M) weather resistant material, basic prefab system that is readily assembled, separated, and coupled
(E) readily reassembleable facility system. High performance washing and cleaning system, readily exchangeable rolling system (for rolling machine), easily expandable and contractable utility system



(1)

[illegible]	[illegible] (2)	(3)
3	[illegible] (8)	
4	[illegible] (12)	
5	[illegible] (16)	
	(20)高生産性の実現	
1	[illegible] (21)	
2	[illegible] (25)	
3	[illegible] (29)	
4	[illegible] (33)	
5	[illegible] (37)	
6	[illegible] (41)	
7	[illegible] (45)	
8	[illegible] (49)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Material plant of the multipurpose type which requires small capital outlay and can be operated with small effort and with good circulation with the development of the necessary software will play large role both at home and particularly abroad
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
78.2	0.68	(9) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (10)	[illegible] (11)
82.1	0.69	(13) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (14)	[illegible] (15)
96.3	0.71	(17) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (18)	[illegible] EPROM [illegible] (19)
92.9	0.72	(22) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (23)	[illegible] (24)
87.5	0.69	(26) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (27)	[illegible] (28)
94.5	0.71	(30) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (31)	[illegible] (32)
92.9	0.70	(34) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (35)	[illegible] (36)
66.7	0.68	(38) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (39)	[illegible] CNC・DNC [illegible] CAM [illegible] (40)
65.2	0.62	(42) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (43)	[illegible] (44)
94.6	0.71	(46) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (47)	[illegible] CAM [illegible] (48)
71.9	0.62	(50) ⊕業界・企業の努力 ⊖費用・投資の額・規模 (51)	[illegible] (52)

11. (M) corrosion resistant material, heat resistant material, weather resistant material
    (C) distribution line system which is readily assembled and disassembled
    (E) tower-tank system that is readily reassembled, high performance washing and cleaning system, readily exchangeable and movable pump, compressor, readily expandable and retractable utility system.
    These will play large roles particularly in the fine chemical area
12. A large fraction of the multivariety small volume processing plants which are difficult to control production-wise will execute communication coordination, overall control, and management through a system in which a section chief on-site talks to a computer
13. (+) industry and firm efforts
14. (-) costs, investment, scale

[Key continued on following page]

15. (E) convenient to use interactive terminal, computer cascade system
    (Sys) interactive control language, interactive machinery control language, group control system, communication control system, accumulation and analysis of fabrication and management software
16. Multiple fabrication, assembly, and production processes will have the multihandling automated, even when the process is frequently altered for multiple product small volume production through the use of various modules and attachments
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (C) EPROM, light sensor array, pressure sensor array
    (E) artificial intelligence robot (with pattern recognition capability), pattern recognition gear, microcomputer
    (Sys) group control system for material handling processes
    (Ser) programming service
20. Emergence of High Productivity
21. "Assembly automation" of the same level or higher compared to present fabrication automation or process automation is established, and the automation and unmanned levels of the equipment assembly processes will become more advanced than presently
22. (+) industry and firm efforts
23. (-) costs, investment, scale
24. (E) computer, pattern recognition gear, assembly robot
    (Sys) training control system, communication control system, various automated assembly machines, group technology for automated assembly development of flexible automated assembly language. There will advance hereafter from fabrication automation to assembly automation, and this will be the time for high level development
25. The technology level of the food industry will be greatly elevated and quality control and multiple product small volume production will see the degree of unmanned operation, efficiency, and volume production reach a level exceeding anything in the world in the various industries
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (E) kneading machine, crushing and cutting machine, ripening machine, taste adjusting machine, sterilizing machine, fermentation facility, food product forming facility, weighing machine, good heating facility
    (Ser) food designing service
29. "Facility diagnostic technology system" which discovers the malfunction sites and their causes in various plants and predict their occurrence beforehand will become practical in many production areas
30. (+) research and development establishment efforts
31. (-) costs, investment, scale
32. (E) computer, leak detector, temperature and pressure measurement devices, gas composition measurement device, broadcast and communication system, alarm facility, AE observation and analysis facility, ultrasonic holographic facility, radiography facility
    (C) AE sensor, stress-strain sensor, deterioration detection sensor, extrafine vibrations and ultrahigh frequency vibration sensor, atmospheric sensor, wide area simultaneous observation sensor

[Key continued on following page]

33. Practical development of a prevention and protection system which understands the overall plant situation regardless of whether a mechanical plant or a process plant is concerned, continually accumulates new information and analyses them, and issues before the fact alerting information from the technological viewpoint

34. (+) industry and firm efforts

35. (-) costs, investment, scale

36. (C) AE sensor, stress-strain sensor, deteriorating-aging/detection sensor, ultrafine and ultrahigh frequency vibration sensor, wide area simultaneous observation sensor

    (E) computer, broadcast and communication system, leak detection device, alarm device, dynamic data bank system. (Prevention protection, and preventive maintenance will be emphasized in this period)

37. Production automation, unmanned technology, remote control technology, repair and maintenance technology, relocation methods of products, semiproducts, and raw materials, and planning methods for fabrication and assembly plants become advanced while the demerits arising from dispersed siting diminish, and the practice of dispersed siting over wide areas becomes generally adopted

38. (+) industry and firm efforts

39. (-) costs, investment, scale

40. (E) NC-DC automated fabrication machine, NC-DC automated assembly machine, pattern recognition device, CNC-DNC measurement machine, CNC-DNC inspection machine, unmanned automatically operated machine

    (Sys) remote control CAM language, CNC-DNC loading machine, computer cascade, transport-handling discharge system for different processes, unit group control system

41. Practical development of a system in which the ordinary magnitude malfunctions of a process plant are repaired, parts interchanged, and inspected in unmanned manner

42. (+) research and development establishment efforts

43. (-) costs, investment, scale

44. (E) pickup robot for worn and damaged parts, material and parts installation robot, inspection robot, minicomputer, automated control system (training control)

    (Sys) data bank system, countermeasures display program

45. Transport of materials and parts, fabrication, assembly, measurement, testing, material handling, packaging, storing, and storage management are systematically controlled by computer, and these complex processes are controlled from a central site far removed from the plant in a CAM which will become commonplace

46. (+) industry and firm efforts

47. (-) costs, investment, scale

48. (E) fabrication machine, automated assembly machine, packaging machine, measurement machine, inspection machine, pattern recognition device, unmanned automated running device, loading machine, computer cascade, transport-handling-discharge system for each process

    (Sys) remote control CAM language, process analysis, system analysis, system design, unit group control system, communication system

[Key continued on following page]

49. Practical development of a system to repair, replace parts, and inspect in unmanned manner the ordinary magnitude malfunctions of machine fabrication plants
50. (+) research and development establishment efforts
51. (-) costs, investment, scale
52. (E) pickup robot for worn fittings and damaged parts, fittings and parts installation robot, inspection robot, minicomputer, automated control system
(Sys) data bank system, countermeasures display program. Development and improvement of inspection and repair robot with artificial intelligence and hand, feet, eyes, and ears will be emphasized

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CONVERSION OF THE INDUSTRIAL STRUCTURE WITH INFORMATION TECHNOLOGY DEVELOPMENT AS NUCLEUS

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 66-73

[Article by [illegible] Ishitani]

[Text] High Density Information Space

According to a certain study conducted overseas, in the advanced world as a whole, productivity in material goods production in the 100-year span from 1861 through 1960 increased 15-fold, but the productivity of business office labor only doubled.

Assuming that office labor is the function of the industrial system which assembles, processes, transfers and transmits, and stores information (records), the technological innovations in the 100 years up through 1960 for increasing production of goods greatly outnumbered the innovations on information processing.

On the other hand, information technology innovations began to speed up from before 1960, and it may be said now that its rate of advancement is faster than that in material production.

Even where material production productivity is concerned, the last 20-30 years was a period in which interprocess, intermachinery, and interfacility information handling and processing have been the major innovations. We will limit the discussion here to information handling and processing between men and between man and the social structure.

The economic development and expansion of Japan after World War II and particularly during the last 20 years have been spectacular and there has been nothing like it in the world.

Accompanying this expansion has been the explosion in the types and volume of information. At the same time, almost all of Japan's raw materials and energy are being imported, and this country which has no recourse but to become a top manufacturing and trading country has now entered the stage in which rapid and accurate processing of information and communication both domestic and international are necessary to adjust and maintain economic and industrial activities.

In this manner, Japan recently came to the stage that it has the highest rate of use of TV, is second in the world to the United States in telephone sets, and is again second in electrical appliances owned, and this nation has fashioned for itself a very high density information space.

Upgrading Information Processing Technology

The concentration and accumulation of people and heavy chemical productive power in the urban areas on a par with the Western countries that have resulted from high level growth have started to impose limitations on comfortable living and smooth industrial activities as a result of which the dispersion of some of this productive power and central control mechanism to other locales and sometimes even to remote separated sites is beginning to be considered and even put into practice.

From here on this country will have to respond to changes in demand structure both domestic and abroad as well as to the resources and energy situation to proceed toward a higher level, knowledge-intensive industrial structure. This will require the collection and analysis of information from at home and abroad on the economic situation, social situation, cultural situation, and technological directions to conduct clearly defined technology development and the transition to a clearly defined technological development with weight directed at goods of high added value and high information added capability.

At the same time, when one looks at the living activities of the individual city resident, the quality of information he comes in contact with necessary to his daily business and living activities is improving in quality and increasing in volume. The need for career training to adapt to the changing environment is evident, and the level of contents of formal education is raised while the volume of information imparted increases. If the judgment powers of the individuals are to be advanced in the midst of this situation and industrial, business, and social activities are to be made more efficient, information processing of ever improving nature, activation of the capabilities of communication, and continued efforts along the line of developing information technology that will cope with the ever increasing multiplicity of information and the highly developing needs of the people, industry, business, and society have to be maintained.

For example, if a large number of business sites and bases are to be established both in Japan and abroad and managed efficiently, various types of information capabilities have to be energized if these activities are to be operated at high performance, diverse manner, and low cost. Unmanned plants and automated warehouses dispersed over the entire country and connected through the medium of high speed data transmission network and managed and controlled from a single center will probably be in vogue in the near future. Another possibility is many autos ranging over wide areas being tied together by radio communication and microcomputers to serve most efficiently from the standpoint of safety and pollution prevention where social effects are concerned.

If we are to maintain as comfortable and safe living in the midst of these various limitations, it is necessary to very carefully draw up the possibilities of information technology, fulfill the needs of society and industry, and develop and improve information related technology subjects.

Low Cost Information Service Will Come on the Scene in the Latter 80's

Technology development from the changes in environment just described which can be expected to be developed from here on includes, first of all, technological development to support the development of individual information processing and transmission service, and programming in a language very close to the ordinary Japanese language, and handwritten Kaisho of the Toyo Kanji list [standard Chinese characters] as OCR input is expected to become possible about 1986-1990. The electronic computer is expected to become very simple to use and inexpensive to obtain, and low cost and valuable information service involving telephones and other two-way active information networks will probably be utilized.

The postal service plagued by manpower shortages and high manpower costs is expected to become extraordinarily expensive along about 1991-1995 as a result of which electronic postal service including facsimile postal service will become commonplace, and educational and entertainment programs will be beamed to Japanese living and working overseas and their children by means of a communication satellite. It is expected that more and more college professors, industrial executives, government officials, and free enterprisers will have TSS terminals in their homes.

In the area of technology development to support development of information treatment and transmission service for business, the 1986-1990 period is expected to see wide use of an automobile telephone system to be extended throughout the country. Information systems and special industries such as the food distribution system are expected to proliferate, and there will be need for business information services and security services to prevent crimes directed at maluse of financial systems and for the safety assurance of hardware.

The popular use of a wideranging computer network system which enables joint use of the country's and world's information processing software data of public, semiprivate, and private nature and low cost conferences between companies in Japan and abroad through two-way TV communication are expected to appear on the scene in 1991-1995.

Technological development to support development of information processing and communication services for the nation and for groups of corporations will include a strong need for development of crime prevention measures using computers expected to come on the scene in 1986-1990.

Along about 1991-1995, we should see the appearance of administration service of the central governmental and local self-governing levels and the daily dissemination of information in a form easy to understand related to future directions and level up in costs which quickly feed back the people's opinions, and these systems will be developed and put into popular use. There is expected to be strong demand for the appearance and popular use of a citizen's numbering system which guarantees individual privacy yet raises administrative efficiency.

Materialization of Artificial Intelligence by the Start of the 21st Century

Technology development along the lines of information processing systems is expected to see the appearance of super small computers (using a few watts power with the capacity of the present medium class computer), electrical transmission of colored figures and color photographs (something on the order of a present-day color print), and remote diagnostic methods resulting from developments in information transmission technology in the 1981-1985 period.

The period between 1986-1990 is expected to see programming in Japanese very close to ordinary language and OCR input of handwritten Kaisho characters of Toyo Kanji become commonplace. Facilities to synthesise any type of conversation, information processing facilities with educational capabilities, new economical and high efficiency storage methods for pictorial information, control systems utilising pattern recognition (such as touch), comprehensive household information transmission system (TV, newspapers, computer time sharing utilisation), home interactive terminals for man-to-computer dialog, and automated libraries (capable of rapid cataloging, storing, searching, and copying through a computer system) be developed.

Control and input of computers by voice is expected to make its appearance in 1991-1995 along with nationwide and worldwide computer networks; automated read-in of subjects, captions, and table of contents of newspaper articles, magazine articles, and books; and selection of necessary items from keyword structure.

At the same time, secondary information will be constructed through an information treatment system that stores this secondary information in a data bank; an automated translation system for handling commercial, scientific, and technological documents between 7 or 8 principal countries of the world will be established; disaster resistant information processing centers will be developed; and an associated memory mode, computer operated, information processing system operating completely unmanned at night and which takes restorative measures (such as repairs) in the event of malfunctions and restarts the system will be developed.

As the 1996-2000 period is entered, an ultrafast large photocomputer [using photon rather than electron circuits] based on light interactions is expected to become practical.

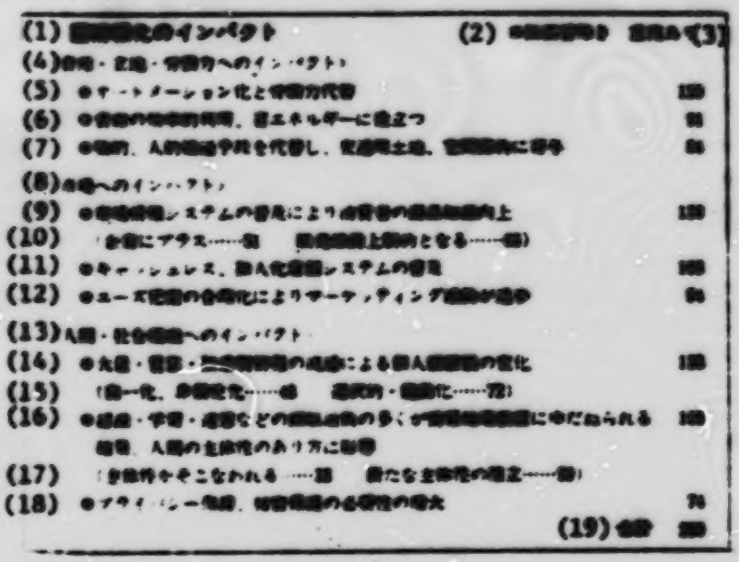
Artificial intelligence at the reasoning level of children, a basic explanation of the nervous system, and the development of artificial intelligence based on the above knowledge are expected to be realised along about 2001-2005.

Technology developments along the lines of communication systems will see remote inspection mode applied to gas, electric, and water lines and the practical appearance of terminals for multiplex data transmission during 1981-1985.

Direct household reception of TV broadcasts from a domestic stationary satellite is expected to go on stream in 1986-1990 accompanied by high speed data transmission at 300,000 bauds or more, and optical fiber cables are expected to find application at about the level of today's telecommunication cables.

Comprehensive conversion facility which can convert communications in various modes such as ordinary conversation, data communications, and pictorial communication; comprehensive terminal facility which can input various types of information such as ordinary conversation, data, and pictures; and communication, broadcast and educational activities through a domestic artificial satellite in countries with wide areas and many noncontiguous areas are expected to develop greatly in the 1991-1995 period. There will be very large volume of information transmitted between the leading countries such as Japan, the United States, West Germany, and the Soviet Union which will require high degree development of millimeter band communication for the communication network trunk lines; fair use of optical [fiber] communication modes, and establishment of disaster resistant communication systems.

All the subjects discussed above have undergone industrialization and are awaiting the period when widespread dissemination will occur such that there is need to start on these subjects in order to give allowance for lead time necessary to their development.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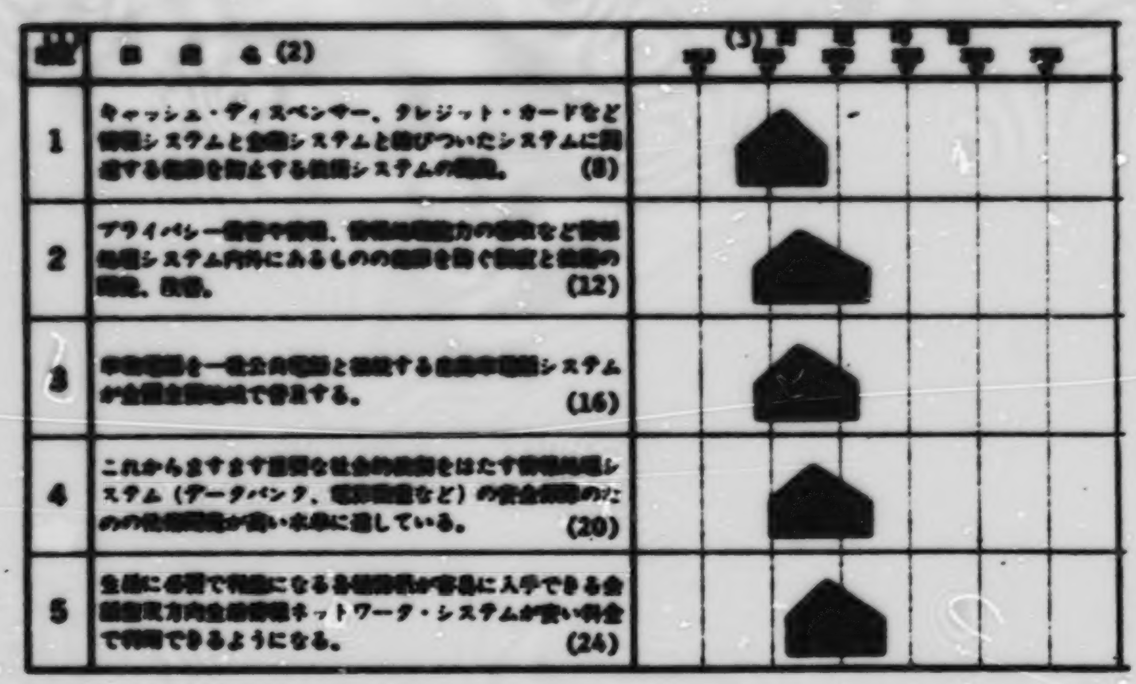
Key:

1. Impact of information
2. Excluding nonrespondents
3. Some duplications
4. Impact on resources, siting and labor force
5. Automation and labor force substitute
6. Efficient utilization of resources, role of energy conservation
7. Replace material and human transport steps, contribute to decreasing land used for transport, and space economy
8. Impact on markets
9. Improvement of consumer's knowledge of goods through market information system popularization
10. (plus to industry—51, serves to save marketing activities—65)
11. Popular acceptance of cashless and unmanned selling system
12. Advance in marketing activities through rational handling of needs
13. Impact on man and social structure
14. Changes in individual's value concept as the result of influx of large volume, abundant, and nondiscriminating information
15. (common front, nonindividualistic—48, selective activation—72)
16. Since much of recognition, learning, and association will be taken over by information processing facilities, man's primary role will be affected
17. (primary role is lost—33, establishment of new primary role—59)
18. Assurance of privacy, increase in necessity for assurance of secrecy
19. Total



[illegible] (1)	[illegible] (2)	(3) [illegible]
1	キャッシュ・ディスペンサー、クレジット・カードなど[illegible]システムと[illegible]システムと結びついたシステムに[illegible]する[illegible]を防止する[illegible]システムの[illegible]。 (8)	
2	プライバシー[illegible]や[illegible]、[illegible]の[illegible]など[illegible]システム内外にあるものの[illegible]を防ぐ[illegible]と[illegible]の[illegible]、[illegible]。 (12)	
3	[illegible]を一般公衆[illegible]と[illegible]する[illegible]システムが[illegible]で[illegible]する。 (16)	
4	これからますます[illegible]な[illegible]をはたす[illegible]システム（データバンク、[illegible]など）の[illegible]のための[illegible]が高い水準に達している。 (20)	
5	[illegible]になる[illegible]が[illegible]に入手できる[illegible]ネットワーク・システムが安い[illegible]で[illegible]できるようになる。 (24)	

Key:

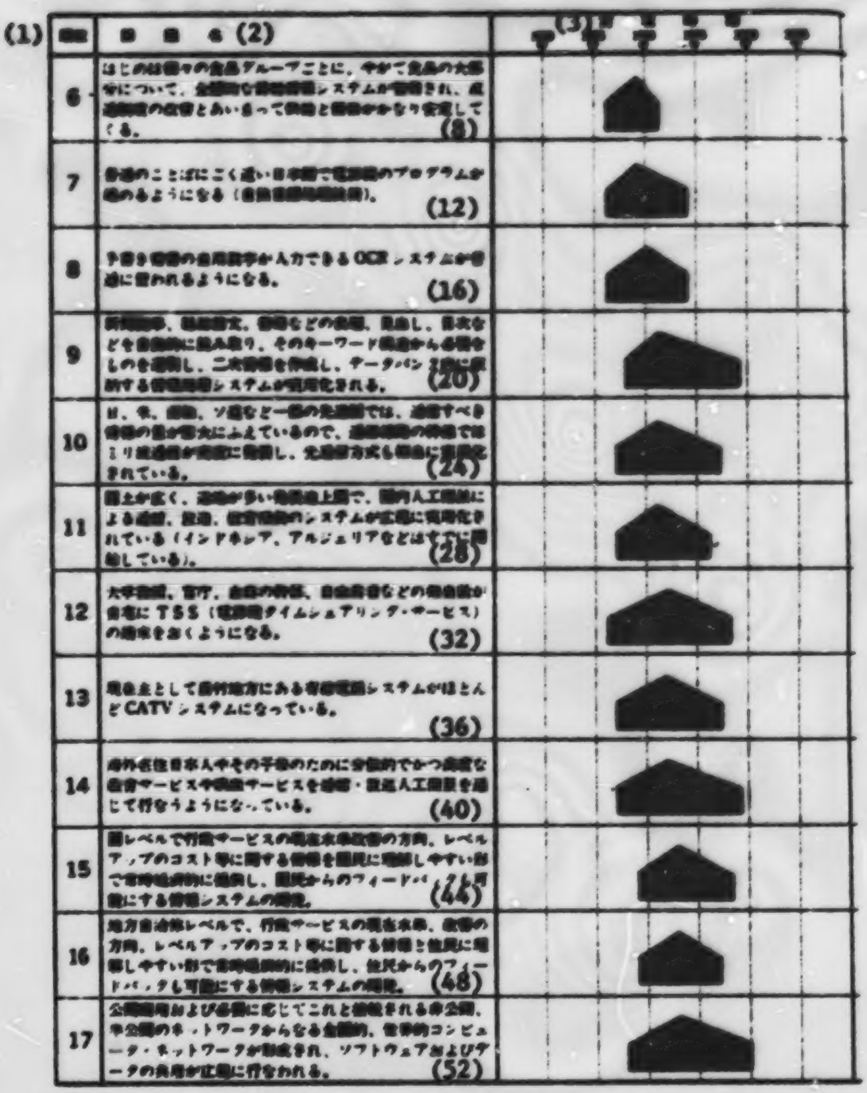
1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Development of technology system to prevent crimes related to systems which tie together information system tied in to cash dispenser and credit systems to financial systems
9. (+) industry and firm efforts
10. (-) costs, investment, scale
11. (C) large volume magnetic disks, magnetic tapes
    (E) computer, writing, identification and recognition gear, fixed voice identification and recognition gear, identification and palm print recognition gear
    (Sys) fixed identification and recognition system of individuals through high degree of pattern recognition, multilevel close check software for orders
12. Development and improvement of system and technology to prevent crimes both from within and without information processing systems such as information that can intrude on privacy and theft of information processing capability
13. (+) people's awareness, consensus
14. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]・[illegible]	コ　メ　ン　ト (7)
94.2	0.75	(9) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (10)	[illegible]多量の磁気ディスク・磁気テープ。[illegible]コンピュータ、[illegible]、音声[illegible]、[illegible]。[illegible]高度パターン[illegible]による個人の[illegible]システム。取引の多量クロスチェック、ソフトウェア。 (11)
96.1	0.71	(13) ⊕[illegible]・国民の[illegible]・コンセンサス ⊖費用・投資の額・規模 (14)	[illegible]多量の磁気ディスク・磁気テープ。[illegible]コンピュータ、音声[illegible]、[illegible]。[illegible]高度パターン[illegible]による個人の[illegible]システム。[illegible]はたえず高度化していく。防止技術もつねに前進することが必要。 (15)
87.0	0.76	(17) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (18)	[illegible]自動車[illegible]、自動車[illegible]、自動車[illegible]。自動車[illegible]と追跡[illegible]、自動車位置[illegible]。[illegible]、[illegible]、自動車電話交換局。[illegible]無線による自動車電話システム。 (19)
98.1	0.73	(21) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (22)	[illegible]ハロンガス。[illegible]温度センサ、燃焼ガスセンサ。[illegible]コンピュータ、音声[illegible]、[illegible]。高度パターン[illegible]による[illegible]と連動したロック[illegible]、[illegible]無人[illegible]。[illegible]無人監視警報システム。情報システムの安全[illegible]に高度の情報処理技術が必要。 (23)
92.3	0.71	(25) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (26)	[illegible]ケーブル、光[illegible]ケーブル、多量の磁気ディスク・磁気シート。[illegible]料金計、[illegible]、リクエスト[illegible]、マイクロフィッシュ[illegible]。[illegible]サービス[illegible]。[illegible]データバンクの作成と[illegible]・[illegible]、情報を[illegible]のように使える情報ユーティリティ・システムの普及。 (27)

15. (C) large volume magnetic disks, magnetic tape
(E) computer, voice recognition and identification gear, palm print identification and recognition gear
(Sys) identification and recognition system of individuals through high level pattern recognition
Information related crimes are continually being upgraded. It is necessary for the prevention technology to keep pace
16. An automobile telephone system which is connected to the general public telephone system comes into general use in all the major parts of the country
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (E) automobile radio, automobile telephone, automobile telephone and radio base exchange, automobile switchover and tracking gear, automobile position automated logging gear
(B) radio base office, radio circuit control office, automobile telephone exchange
(Sys) automobile telephone system using radio
20. Technological development to assure safety of information processing system (such as data bank, computer centers) which will play increasingly more important roles from here on will attain higher levels
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (M) Halon gas
(C) temperature sensor, combustion gas sensor
(E) computer, voice recognition and identification gear, palm print recognition and identification gear, lotter [phonetic] gear connected to high level pattern recognition type recognition and identification gear, instantaneous automated unmanned power source gear
(Sys) unmanned observation and alarm system. High level information processing technology required for safety assurance of information system

[Key continued on following page]

24. Conversational type two-way living information network system which enables ready access to various information profitable and necessary to living will become available at low cost
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (C) coaxial cable, optical fiber cable, large volume magnetic disks and magnetic sheet
(E) use-fee calculator, broadcast response gear, automated repeat broadcast service gear
(Sys) construction, revision, and maintenance of data bank, popular use of information utility system in which information is used just as hot water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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Starting with individual food groups and then expanding to the greater fraction of foods, nationwide demand system will be established to improve the supply system and stabilize both supply and cost
9. (+) people's awareness, consensus
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
94.2	0.72	(9) [illegible] (10)	[illegible] (11)
88.7	0.76	(13) [illegible] (14)	[illegible] (15)
82.7	0.73	(17) [illegible] (18)	[illegible] (19)
83.0	0.70	(21) [illegible] (22)	[illegible] (23)
98.0	0.74	(25) [illegible] (26)	[illegible] (27)
98.1	0.72	(29) [illegible] (30)	[illegible] (31)
69.8	0.70	(33) [illegible] (34)	[illegible] (35)
75.0	0.70	(37) [illegible] (38)	[illegible] (39)
69.8	0.68	(41) [illegible] (42)	[illegible] (43)
83.0	0.66	(45) [illegible] (46)	[illegible] (47)
87.0	0.68	(49) [illegible] (50)	[illegible] (51)
74.5	0.67	(53) [illegible] (54)	[illegible] (55)

11. (C) large volume magnetic disks and tape
    (E) computers, terminals
    (Sys) establishment, expansion, and generalization of food standards and regulation
    Provision of system for food acquisition and transport
    (Ser) food demand information service
12. Japanese very close to the common language will be used to construct computer program (natural language processing technology)
13. (+) industry and firm efforts
14. (-) costs, investment, scale
15. (E) computers
    (Sys) understanding mechanism technology (establishment of semantics, syntax theory), compilation and development of glossaries, language conversion technology, language synthesis technology, need for everyone to be able to use computers to a certain extent

[Key continued on following page]

16. OCR system with input of handwritten Kaisho Kanji of the Toyo Kanji list will come into common use
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (C) photo sensor
(E) intelligent OCR, OCR sensor array, microcomputer (or minicomputer)
(Sys) pattern recognition system (at the handwritten Kaisho level, establishment of software)
20. Subjects, headlines, and table of contents of newspaper articles, magazine articles, and books will be scanned, necessary words will be selected from the key word list, secondary information will be constructed, and this will be stored in a data bank in the information processing system that will become practical
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (C) large volume magnetic disks and tapes
(E) OCR handling mixed Kanji text, computer
(Sys) general and special use thesaurus, semantic structure judgment and selection software, date bank system
(Ser) secondary information production service (industry, government offices, individual use)
Date banks automatically produced and maintained are increasingly needed
24. In view of the expected large increase in volume of information communicated between the leading countries such as Japan, the United States, West Germany, and the Soviet Union, high degree of development millimeter band communication will be adopted in the trunk lines of the communications network, and optical communication modes will also find considerable application
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) optical fiber, wave guide metal materials, semiconductor materials, chemical-compound semiconductor material
(C) millimeter band wave guide, optical communications cable, relays, branching unit, various semiconductor units for laser use, various semiconductor elements for millimeter band use
(E) millimeter band communication unit, optical communication unit, laser oscillator, laser modulator
28. Communications, broadcast, and educational activity systems covering wide areas in countries of wide area and many peripheral noncontiguous lands will become practical (a start has been made in Indonesia and Algeria)
29. (+) political organizational role
30. (-) costs, investment, scale
31. (C) various antenna, various batteries, solar battery, fuel cell
(E) communication and broadcast satellite, various communication equipment, broadcasting transmitter, various receivers, video receivers, communication and broadcast system, various power sources
(B) communication center, relay station, satellite broadcast and communication ground station
(Sys) satellite communication and broadcast system
Japan is planning to place a test satellite in an equatorial orbit for domestic use

[Key continued on following page]

32. A large fraction of college professors, government officials, industrial cadre, and free enterprisers will have TSS (computer time sharing service) terminals at home
33. (+) industry and firm efforts
34. (-) costs, investment, scale
35. (E) cheap and easily usable TSS terminal (from input-typewriter to intelligent terminal)
(Sys) data transmission system using public telephone lines
(Ser) TSS service
36. The present mainly wire telephone systems in rural agricultural areas will become nearly all converted to CATV systems
37. (+) people's awareness, consensus
38. (-) costs, investment, scale
39. (C) coaxial cable, relay, branching device
(E) transmitter for CATV, video receiver (capable of two-way transmission in many cases), power source
(B) CATV transmission station
(Sys) CATV system
(Ser) consultation, construction installation service
40. Educational and entertainment service through communication and broadcast artificial satellites will be provided for Japanese assigned overseas and their children
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (C) antenna for direct reception of satellite broadcast
(E) automated program dispatch, automated (unmanned) transmitter, automated (unmanned) broadcaster, direct receiver of satellite broadcast
(Sys) satellite communication system, satellite broadcast system, coordination with laws of countries concerned
44. Development of an information system by which directions through which present levels of administrative service can be improved and costs of improvements type information will be disseminated on a national scale in a manner readily understandable by the people and which can also handle the feedback from the people
45. (+) people's awareness, consensus
46. (-) costs, investment, scale
47. (C) large volume magnetic disks and tapes
(E) computer, voice synthesis device
(B) various classes of administrative publicizing centers
(Sys) administration information data bank, fully automated-semiautomated information search system, administrative information automated early warning system (modern version of standards box)
It will be possible to know in short time the opinions of a wide array of people
48. Development of an information system which is capable of submitting information relating to local self-governmental level affairs aimed at raising present levels of administrative service, improve directions, and discuss costs of raising levels in a manner easily understood by the people and which is also capable of handling the feedback from the people
49. (+) people's awareness, consensus
50. (-) costs, investment, scale

[Key continued on following page]

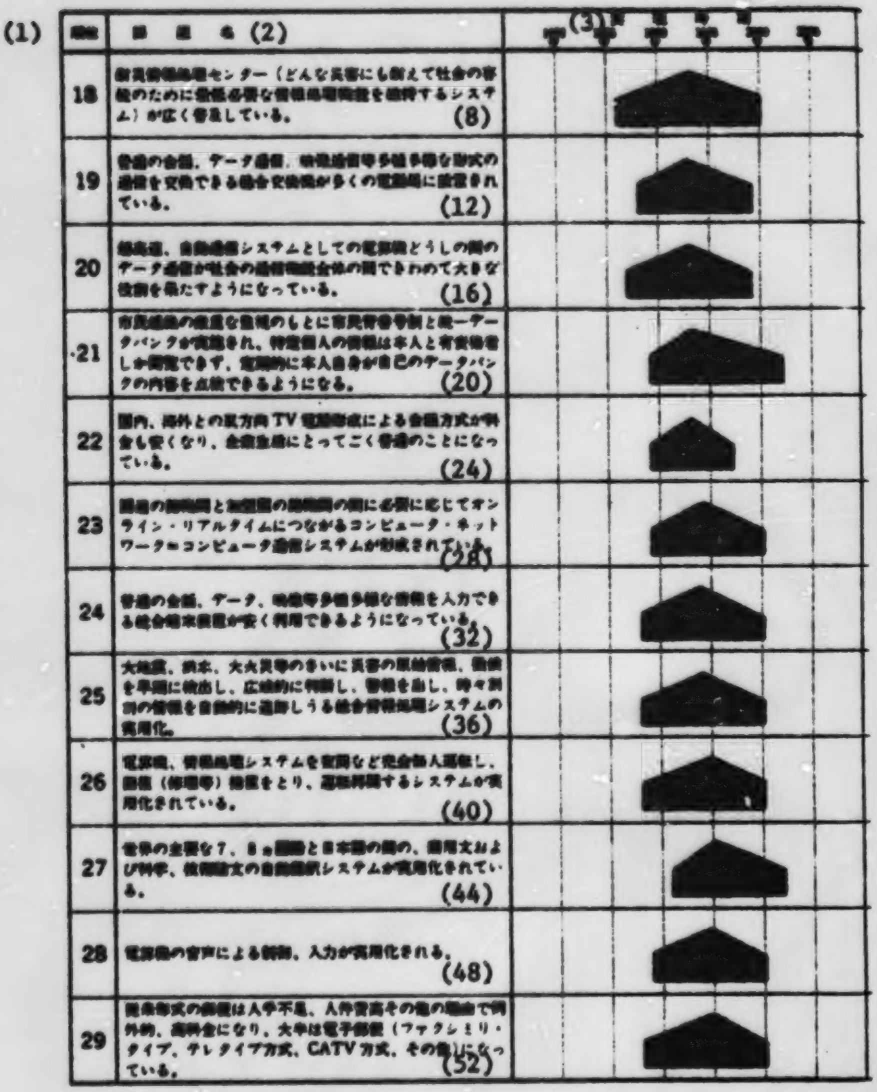
51. (C) large volume magnetic disks and tape
(E) computer, voice synthesis device
(B) various classes of administrative publicizing centers
(Sys) administrative information data bank, fully automated, semiautomated information search system, administrative information early warning system (modern version of standards box)

52. A national and worldwide computer network is assembled from public commercial networks and if necessary semipublic and private networks, and software and data are used jointly over wide areas

53. (+) research and development establishment efforts

54. (-) costs, investment, scale

55. (E) large capacity high performance data communication exchange
(Sys) high level identification system, satellite communication system, countrywide computer network, world computer network, connection software, data bank. Not only information processing capability but information itself can be used.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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Disaster resistant information processing centers (system which can withstand any kind of disaster and which will maintain minimum necessary information processing capability to continue existence of society) will be widely dispersed
9. (+) research and development establishment efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
92.2	0.69	(9) [illegible] (10)	[illegible] (11)
96.2	0.70	(13) [illegible] (14)	[illegible] CPU. (15)
90.4	0.72	(17) [illegible] (18)	[illegible] (19)
38.5	0.40	(21) [illegible] (22)	[illegible] (23)
88.9	0.71	(25) [illegible] (26)	[illegible] CVD [illegible] TV [illegible] PCM [illegible] PCM [illegible] (27)
84.6	0.70	(29) [illegible] (30)	[illegible] (31)
88.2	0.70	(33) [illegible] (34)	[illegible] CRT [illegible] (35)
98.1	0.72	(37) [illegible] (38)	[illegible] (39)
80.8	0.69	(41) [illegible] (42)	[illegible] (43)
90.6	0.71	(45) [illegible] (46)	[illegible] (47)
86.5	0.70	(49) [illegible] (50)	[illegible] (51)
66.7	0.69	(53) [illegible] (54)	[illegible] CATV [illegible] (55)

11. (M) Halon gas
    (C) gaseous fire extinguisher
    (E) automated instant switchover power supply, earthquake-proof structure for installing computer, computer, communication unit, earthquake-proof structure for installing communication unit
    (B) fireproof information processing center
    These will exploit their value during the large earthquakes which are bound to come
12. Comprehensive conversion facility which can convert ordinary conversation, data communication, and video communication multiple-nature communication will be placed at many telephone exchanges
13. (+) industry and firm efforts
14. (-) costs, investment scale

[Key continued on following page]

15. (C) super large capacity memory element
    (E) electronic exchange of multiple diverse mode and vast memory capacity
16. Data communication by super high speed and automated transmission system involving data communication between computers will play major roles in the communication capability structure of society
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) optical fiber for optical communication
    (C) coaxial cable, optical transmission cable
    (E) various classes of computer, communication controllers, relays, amplifiers, intelligent terminal data communication converter
    (Sys) satellite communication system, communication control system
20. Citizen's identification system and systematized data bank will be set up under strict surveillance of citizen organizations, an individual's information can be seen only by the individual and authorized party, and the individual will inspect his data bank contents at stated periods
21. (+) organizational role of administration
22. (-) people's awareness, consensus
23. (C) large volume magnetic disks and tapes
    (E) computer, large volume terminals
    (Sys) citizen's number system and laws, regulations-type legal system related to data bank items of these numbers, citizen's representative participate in the legalization of a system with authority.
    Detailed administration service will bring about sharp increase in citizen's information
24. Two-way TV conversation both within the country and to other countries for conferences will become low in cost and become commonplace business activity
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) quartz glass for optical fiber use (by CVD method, etc.)
    (C) optical fiber communication cable
    (E) comprehensive communication exchanger including picture, TV telephone, PCM communication unit
    (Sys) optical communication system, satellite communication system, PCM communication mode
28. A computer network computer communication system for on-line real time communication with various UN organs and allied organs will be established
29. (+) political organizational role
30. (-) costs, investment, scale
31. (C) large volume magnetic disks and tapes
    (E) intelligent terminal
    (Sys) computer network system, satellite communication system, communication control system
    (Ser) worldwide data communication service
32. Comprehensive terminals which can input various forms of information such as ordinary conversation, data, and pictures will become available at low cost
33. (+) organizational role of administration
34. (-) costs, investment, scale
35. (E) total input-output intelligent terminal, optical sensor array, TV camera, CRT display, input-output typewriter
    (Sys) voice recognition software, image recognition software

[Key continued on following page]

36. Practical development of a comprehensive information processing system which detects initiation and course of large earthquakes, floods, and fire disasters, judges the effects over wide areas, sounds alarms, and periodically follows the information in automatic manner
37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (E) multiple deployment of observation robots, computers, communication unit, large area color display, disaster prevention information and countermeasures control panel, communication control facility
    (B) fire resistant information processing center
    (Sys) disaster prevention information active man-machine system, communication control system, evacuation guidance safety information system, self-repairing system, software
40. A system will be developed in which computers and information processing systems will operate completely unmanned at night, engage in restorative (repair) functions, and reinitiate the system
41. (+) research and development establishment efforts
42. (-) costs, investment, scale
43. (E) information system observation and maintenance computer with enclosed power supply, training controller, self-repair gear (such as use of robots)
    (Sys) unmanned transport system, self-repairing system, software
44. An automated translation system handling Japanese to or from seven or eight other languages will become practical for translating business, scientific, and technological articles
45. (+) research and development establishment efforts
46. (-) costs, investment, scale
47. (E) computer, COR for handling characters of different languages, character printer for different languages, word processors for different languages
    (Sys) assembly, use, sale of thesaurus and dictionaries of general and special use in different languages, automated translation software for science and technology literature
48. Voice control and input into computers will become practical
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (M) piezoelectric material
    (C) sound-electrical transducer element
    (E) voice control input terminal device, computer
    (Sys) development and improvement of voice recognition algorithm; voice input facility capable of discriminating 100, 200 words is already being marketed
52. The postal system has become exceptionally expensive because of lack of manpower and the high cost of labor, and future communication will for the most part be through electronic postal (facsimile, teletype, CATV, or other) communication
53. (+) research and development establishment efforts
54. (-) costs, investment, scale
55. (M) facsimile paper
    (E) cheap and easily usable facsimile for general use, message receiving facsimile using open CATV channel
    (B) electronic mail receiving office
    (Sys) electronic postal system

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CSO: 8129/1906

FROM 'MALADY TREATMENT METHOD' STAGE TO 'BASIC TREATMENT STAGE'

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 75-77

[Article by Hirosaburo Tasugi]

[Text] Environmental Safety

There Are Limits to Nature's Capacity

Man is the only organism which observes [as published] the rules of the natural ecology yet keeps on increasing, but this increase till very recently has been greatly abatted by the magnitude of the natural environment as a result of which he has been unaware of the implications of environmental pollution.

The population explosion and production explosion which followed the industrial revolution has resulted in localized worsening of the environmental problem.

On the other hand, pollution had not advanced to the state that a country's principal regions become universally entwined.

Man as an individual or in group brings in items and energy from outside which he assimilates, to as high a degree as his level of technology will allow, to work toward perpetuation of his kind while discarding what he cannot assimilate to the external environment. It has been the story of mankind to discard uneconomic items and retain only the economical and valuable items. In addition, he has behaved as though this was without consequences because the discharge of uneconomical items was relatively small compared to the capacity of the environment.

This was followed by a stage in which the per unit producer and consumer discharge of uneconomical items was decreasing, yet the tremendous growth in population and productivity resulted in straining the limits of what had once been thought the inexhaustible capacity of the environment just within the times of present history, and we are at a stage that we can no longer discard these items.

As the latter half of the 20th century was entered, this situation developed to a state that there is no doubt as tq the environmental limits. Not only must uneconomical items be internally contained but urban living and production activity can cause damages in events that everyone sees.

On the other hand, it is extremely difficult to completely change a life style to which we have been accustomed to in the past. This is where the deep environmental problem arises.

This internal containment of uneconomical items is not limited to industrial technology but takes in all other areas including systems, social awareness, and culture making it a problem that will require long time and great difficulty to resolve. However, it is one that has to be resolved.

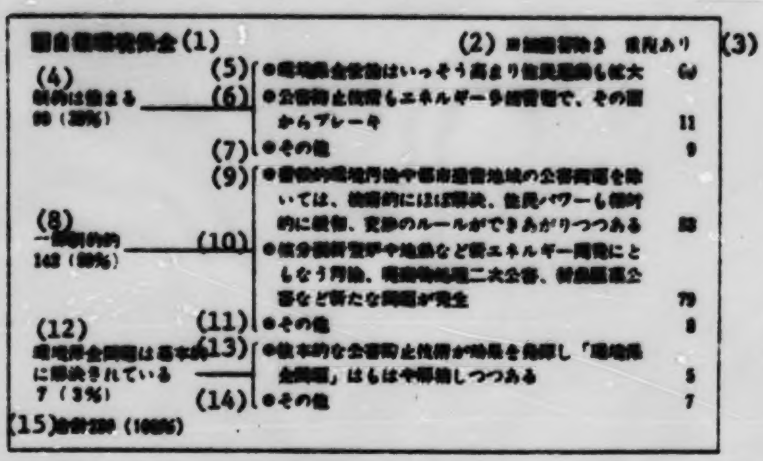
Japan's Leading Pollution Countermeasures

Japan is a narrow country particularly with respect to inhabitable land, yet its land has been very productive as a result of which it has long maintained a high population density. This was why the tacit assumption of a limitless environment which spurred concentrations of population and productive power did not cause large damage was made.

On the other hand, the Meiji restoration was followed by the advancements in modern industry, and the period after World War II was particularly noteworthy for the siting of heavy chemical industries along the Pacific belt in response to the world's industrial, technological, economic, and trade situation to set up "world's material plants and the mass production machinery plants." The concentration of heavy chemical industry, resources consuming population, and population per square kilometer proceeded as a result. The net result was that environmental problem emerged in Japan ahead of the other leading countries in the midst of this period of high economic growth.

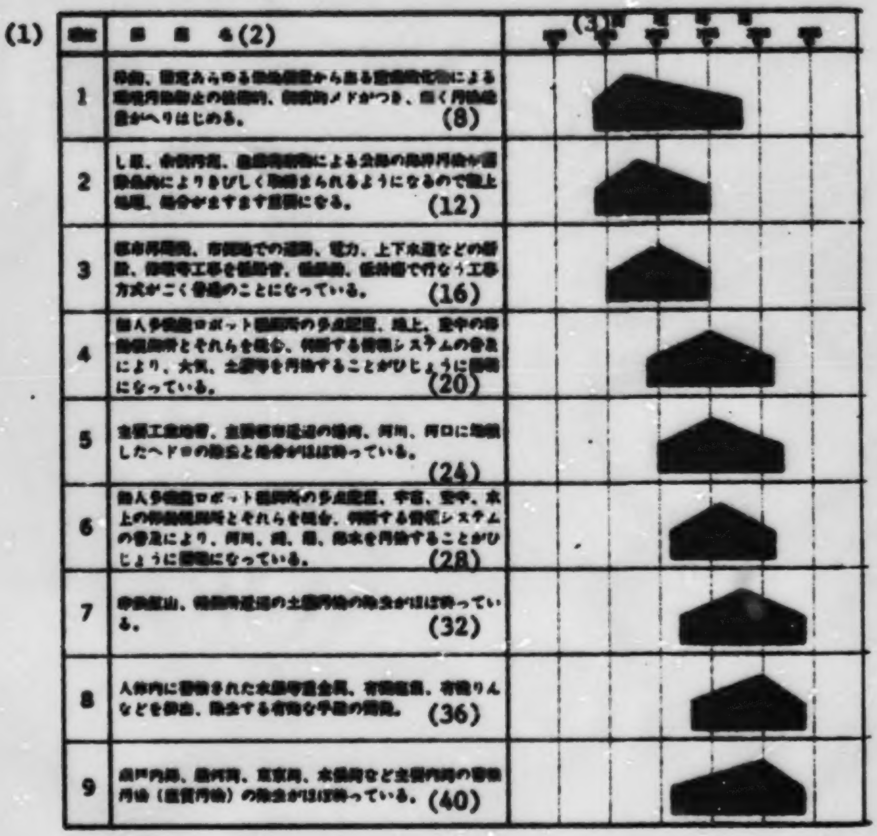
Cleaning up the environment requires the consumption of energy resources. Almost simultaneously with the worsening environmental problem came the oil shock and the resources and energy problem. Oil is a resources product which initially was a buyer's market item but has over the long term evolved into a seller's market item. The price of resources products has increased greatly. This has been accompanied by the overall economy of the leading countries shifting to a low growth base, and it has become difficult to convert the greater part of raw material energy into products. It is in the midst of such a situation that the quality of the environment has to be improved.

At the present time, Japan's environmental standards and cleanup technology are at the world's highest levels. Our efforts from here on will be the completion of this "malady treatment stage" to remove pollution to be followed by its systematization and completeness. This will be accompanied by efforts to remove the pollution that has accumulated and then proceed to a "basic treatment" stage to lead the world in this category. While there are differences in degree and time, the path this country must take will be one which every country in this world will have to follow.



Key:

1. Natural environmental protection
2. Excluding nonrespondents
3. Some duplication
4. Limitations are increasing
5. World opinion on environmental protection is increasing and there are large people's movements
6. Pollution prevention technology is energy consuming and this is a brake
7. Other
8. Partly limited
9. Eliminating pollution problems of cumulative environmental pollution and urban overdensity, there is essentially technological resolution, citizen's power is relatively relaxed, and negotiation rules are being set up
10. Pollution accompanying new energy development such as new fission reactors or geothermal energy, secondary pollution due to waste processing, and pollution from new pesticides are new problems which emerge
11. Other
12. Environmental problems basically can be resolved
13. Outstanding pollution prevention technology effects have been exploited, and "environmental protection problem" has been resolved
14. Other
15. Total 239 (100%)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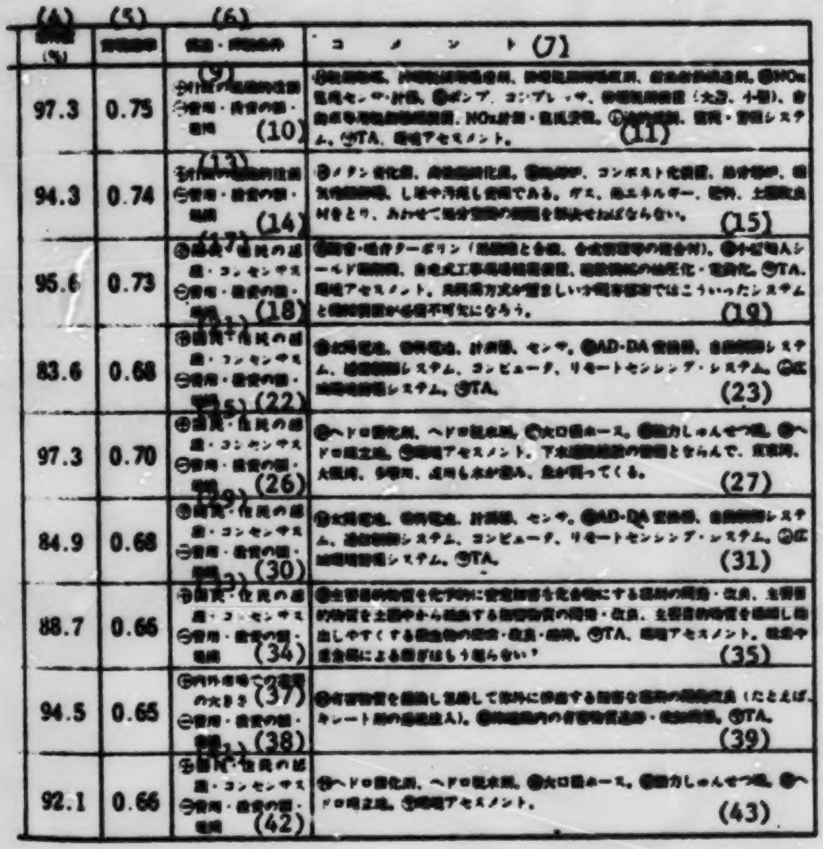
Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Systematic goals for stopping environmental pollution by nitrogen oxides produced by both mobile and fixed combustors are finally developed and total pollution finally begins to abate
9. (+) organizational role of administration
10. (-) costs, investment, scale
11. (M) denitrification catalysts, smoke denitrifying adsorbant, smoke denitrifying absorbant, heat and corrosion resistant construction material
    (C) NO_x observation sensor
    (E) pump, compressor, smoke denitrifying device (large, small), denitrifying catalyst device for automobiles, NO_x meter, observation device
    (Sys) legal observation, observation and alarm system
    (Ser) TA, environmental assessment
12. International treaties on ocean pollution by excrement, excess sludge, and industrial waste become more and more severe as a result of which treatment and disposal on land become more important
13. (+) organizational role of administration



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97.3	0.75	(9) [illegible] (10)	[illegible] (11)
94.3	0.74	(13) [illegible] (14)	[illegible] (15)
95.6	0.73	(17) [illegible] (18)	[illegible] (19)
83.6	0.68	[illegible] (22)	[illegible] (23)
97.3	0.70	[illegible] (26)	[illegible] (27)
84.9	0.68	(29) [illegible] (30)	[illegible] (31)
88.7	0.66	[illegible] (34)	[illegible] (35)
94.5	0.65	[illegible] (37) [illegible] (38)	[illegible] (39)
92.1	0.66	[illegible] (42)	[illegible] (43)

14. (-) costs, investment, scale
15. (M) methane producing bacteria, high performance digestion bacteria
(E) incineration furnace, composting facility, thermal decomposition furnace, anaerobic fermentation vat. Excrement and sludge are also resources. Gas, thermal energy, fertilizer, and soil conditioners must be recovered and the disposal space problem also must be resolved
16. Urban redevelopment and new construction, and repairs of city streets, power lines, water system, and sewer system are performed through low noise, low vibration, and low dust operations
17. (+) people's awareness, consensus
18. (-) costs, investment, scale
19. (M) soundproofing sound absorbing tarpaulin (composite material of lead fiber and synthetic fiber, resin)
(E) small unmanned shield drilling machine, self-running construction site covering device, hydraulic and electric powered construction machinery
(Scr) TA, environmental assessment
A joint structure affair is desirable, and such a system together with machine facilities may become indispensable to already existing cities
20. Information systems to collect and judge information obtained by unmanned multiple purpose robot observation posts deployed at various sites and land and air observation posts become commonplace as a result of which it will become difficult to pollute the air and soil

[Key continued on following page]

21. (+) people's awareness, consensus
22. (-) costs, investment, scale
23. (C) solar battery, fuel cell, measurement instruments, sensor
(E) AD-DA transducer, automated control system, communication control system, computer, remote sensing system
(Sys) wide area environmental information system
24. Sludge accumulated around major industrial belts and harbors, rivers, and streams about major highways is finally removed and disposed of
25. (+) people's awareness, consensus
26. (-) costs, investment, scale
27. (M) sludge solidification agent, sludge dehydrating agent
(C) large diameter hose
(E) reinforced dredging machine
(B) sludge reclaimed land
(Ser) environmental assessment, along with completion of sewers and roads, waters of Tokyo Bay, Osaka Bay, Tamagawa, and Yodogawa become clear and fish return
28. Information system to collect and assess information collected by unmanned multiple purpose robot stations deployed at various sites and mobile observation posts in space, air, and on sea becomes commonplace making it very difficult to pollute rivers, lakes, marshes, and the sea
29. (+) people's awareness, consensus
30. (-) costs, investment, scale
31. (M) solar battery, fuel cell, measurement instrument, sensor
(E) AD-DA transducer, automated control system, communication system, computer, remote sensing system
(Sys) wide area environmental information system
(Ser) TA
32. Removal of contaminated soil around nonferrous mines and refineries is essentially complete
33. (+) people's awareness, consensus
34. (-) costs, investment, scale
35. (M) development and improvement of chemically stable and nonpolluting compounds as major object material, development and improvement of nonpolluting materials extracted from soil to serve as major object material, search, improvement, and maintenance of microorganisms that enable ready concentration of major desired material
(Ser) TA, environmental assessment.
Will there be any more excitement over arsenic and heavy metals?
36. Development of effective means to extract and remove heavy metals such as mercury and organochlorine, organophosphorus, and such from the human body
37. (+) scale of demand in home and foreign markets
38. (-) costs, investment, scale
39. (M) development and improvement of nontoxic chemicals to replace toxic materials, envelope them and extract them from body (such as continuous injection of chelating agents)
(C) tracking and detection instrument for toxic materials in body tissues
40. Removal of accumulated pollution (low grade pollution) from the Inland Sea, Suruga Bay, Tokyo Bay, and Minamata Bay areas is essentially complete
41. (+) people's awareness, consensus

[Key continued on following page]

42. (-) costs, investment, scale
43. (M) sludge solidification agent, sludge dehydrating agent
    (C) large diameter hose
    (E) reinforced dredging machine
    (B) sludge reclaimed land
    (Ser) environmental assessment

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CSO: 8129/1906

IMPROVE LIVING ENVIRONMENT THROUGH SYSTEMATIC TECHNOLOGY DEVELOPMENT

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 78-89

[Article by Hideaki Narikawa]

[Text] Highest Housing Costs in the World

Japan has long been a land of very high population density. At the same time, the productivity of this warm and moist environment has been the highest among the leading countries, and small dispersed farms have dominated from the past. This was followed by the concentration of people in the urban areas, and the land in the cities began to be parceled out in very small areas. In addition, planned development of cities was slow in materializing such that clear demarcation between residential zones, commercial zones, and industrial zones was not made, resulting in today's complex situation.

In this manner, the urban areas are deficient in adequate residential space, and land is very high in cost. At the same time, the residential zones are bothered by the polluted air and water as well as noise and vibrations from the closely neighboring industrial plants. In addition, it was the situation in many cases that industry and business which were the "early arrivals" in newly developed areas realizing the plight of the people who followed and sited their plants to more remote areas in increasing manner.

In this manner, the development and offering of residential areas which provided the daily conveniences in comparatively desirable manner yet free from various adverse environmental factors and improvement of existing sites for industry and improvement of existing sites and siting of new plants as well as the placement of industrial activities in more remote areas type infrastructure may become more and more important from here on.

The homes for the average Japanese are very high in cost compared to other leading countries because of the country's special background, customs developed over long periods, the people's likes, and the delayed response in both systematic and industrial manner to the housing problem. The problem of providing good quality homes at low cost is not something that can be resolved in short order, and there is much room for great affort along the lines of systematic and component technology development together with the resolution of problems such as industrial structure, markets, and fiscal and legal systems.

Improvement of Living Environment Is Chronic Need

During the past dozen years or so the highways and railways of Japan have advanced in quality and volume to the extent that there are not many comparable systems. However, many problems are left in the matter of high speed communication between districts, distribution of things, distribution in cities, and high speed traffic in cities.

At the same time, many of Japan's cities lack adequate water for living, and lack of runoff capacity for city streets causes localized weather problems, and these are major problems that need quick resolution.

In another direction, effective collection and disposal sites for trash created by the social system, transport system for trash to the disposal sites, means for economical development of city streets, and reduction of noise and vibrations in residential districts are policies which are increasingly becoming more important.

This is why there has to be many innovative improvements along the system and social awareness fronts in order that this country's urban life can proceed smoothly and pleasantly in the future, and a great many technological developmental subjects need to be taken up.

The technological developmental subject groups which have to be considered to realize the resolution of Japan's urban problems over the long term will be classified under the following three groups (excluding the environmental safety problems listed under a separate column): 1) space assurance problem group (assurance of space for homes and business activities), 2) technology problem group related to transport, traffic, and distribution (to insure smooth orderly traffic and distribution within and between cities), and 3) development problem group on homes, urban environment (stable supply of good quality and low cost homes and improvement of urban living environment and living environment boundaries).

The Foot of Mt Fuji Will Be the Bed Town of Tokyo

The results compiled from this latest technology prediction will be used as the basis for assigning the time periods when the three types of technology development subjects listed above are expected to materialize (when they will actually be industrialized and diffused).

Looking first at the technology development group related to the assurance of space, the period between 1981-1985 will see the rapid development of simple and cheap foundation improvement technology for low level construction, methods of stabilizing and reinforcing rock and soil (particularly clay minerals), reinforced aged concrete structures of varied types, regeneration technology, razing of concrete structures at low cost and quickly, and waste materials disposal technology.

A technology system to convert sloping land into suitable residential land and emergence of a residential construction mode that enables efficient utilization of land in the face of the population density and still retain the charm of residential living will be in great demand by 1986-1990.

The 1991-1995 period is expected to see the emergence of a technology system to redevelop as cheaply as possible deteriorated, slummy, and spoiled city districts; high speed and low cost traffic system that will enable remote resort areas such as Fuji, Yatsugadake, and Nasu become the bed towns for Tokyo; and construction of medium and high rise factory buildings for medium and small industries and redevelopment of existing plant zones.

The 1996-2000 period will see development of efficient excavating and constructing technology for deep underground construction and underground facilities such as storage facilities, energy facilities, and production and fabrication facilities will be economically sited.

Looking next at the technology subject group involving transport, traffic, and material flow, large trucks with low noise and electric automobiles which can travel more than 400 km on a single charge are expected to become commonplace in 1981-1985.

The 1986-1990 period is expected to see the introduction of shuttle service between principal cities using STOL medium passenger planes, bus transport service between principal cities and to various tourist sites in which high speed gas turbines provide power, and air bus service using medium VTOL passenger planes between international airports and major cities, devices to prevent collision and contact between automobiles, automobile operation where high speed travel on special highways will be via a safe guidance system, super high speed railroad HGST (500 km/hr) using superconducting magnetic levitation, short takeoff and landing transport plane for use on irregular ground, and small (up to about 30 liters) individual automated transport system (in tubes) will play major roles in transportation and distribution.

As the 1991-1995 era is entered, electric automobiles are expected to carry more than half the small item deliveries in the centers of large cities, optimum control systems for urban traffic (including automated guidance automobile highways), automobile engine using hydrogen as fuel, railroad network using completely unmanned express trains in automated control transport system to cover wide areas, and pipelines to carry most of the oil, oil products, and coal type fuels within the country are expected to play major roles.

Along about 1996-2000 electric community cars that are small, nonpolluting, safe, and low in cost and which are community cars which can be relinquished after use may possibly make their appearance. A products express train in which cars are placed within large diameter steel pipes upon which containers with goods are loaded and transported by superconducting or ordinary magnetic levitation by a linear motor affair, terminal material flow system in which goods are delivered in unmanned manner from district distribution centers to homes, and underground tubes powered by compressed air or vacuum for delivering goods from parcel depots and collection centers to intermediate streets are also expected. The delivery of goods in automated manner to areas 10 times the size of present residential areas where the service runs smoothly is anticipated.

Waterways connecting the Japan Sea to the Pacific by way of Lake Biwa and into the inner reaches of the Kanto plain which allow the passage of dry cargo ships and tankers are expected to come into service between 2001-2005.

Industrial Production of Homes Will Advance

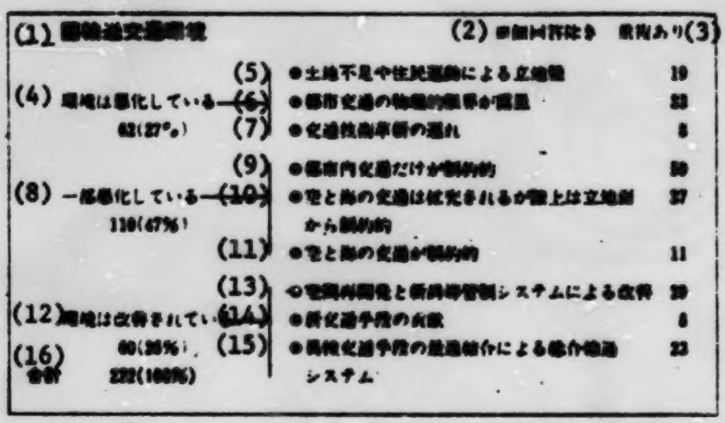
Under the development subject group on improvement of residential and urban environment, the 1981-1985 period should see the unitization; simplified assembly, separation, transport, and reassembly technology; and use mainly of metal building materials as the heart of industrial production of homes that are low in cost, high in quality, and suited to the Japanese way of life. Local industrial parks where trash is used as heat source and air conditioning energy for an entire block city, town, or village unit are expected to materialize.

The BOD and COD standards are expected to become even more strict in 1986-1990. Water quality will be improved as a result, and people will be able to fish on their leisure time. Pleasure lakes and plains area reservoirs will become common for flood prevention, emergency water supply, and fishing.

Along about 1986-1990, excepting the very high class structures, most of the homes and apartments will be factory produced units which will be assembled on-site. Factory homes which are easy to maintain which are complete inside and out and furnished will become popular.

The 1991-1995 period should see residential structural units and equipment units sold on the open market. The use of foamed steel as insulating material and pillar material will become practical, and the design of materials which do not offend man's psychological, subjective, and physiological reactions are highly desirable. Water mains will be installed in urban redeveloped areas and new residential parks. Sewage water and rain water will be subjected to high level treatment to provide water for sundry use and toilet use. Trash disposal sites located around cities and excess sludge accumulation sites will be converted to parks, a source of supply of trees and plants, home garden use for city people, and a source of organic foods. Urban redevelopment and newly designed residential parks must, as a general rule, provide garages and driveways, and the home must be of a construction protecting against the noise of the street.

City trash excepting bulk trash will be disposed of in compressed air or vacuum operated tubes installed along streets and high speed highways to be transported to intermediate stock points in the system that is expected to emerge along about 1996-2000.

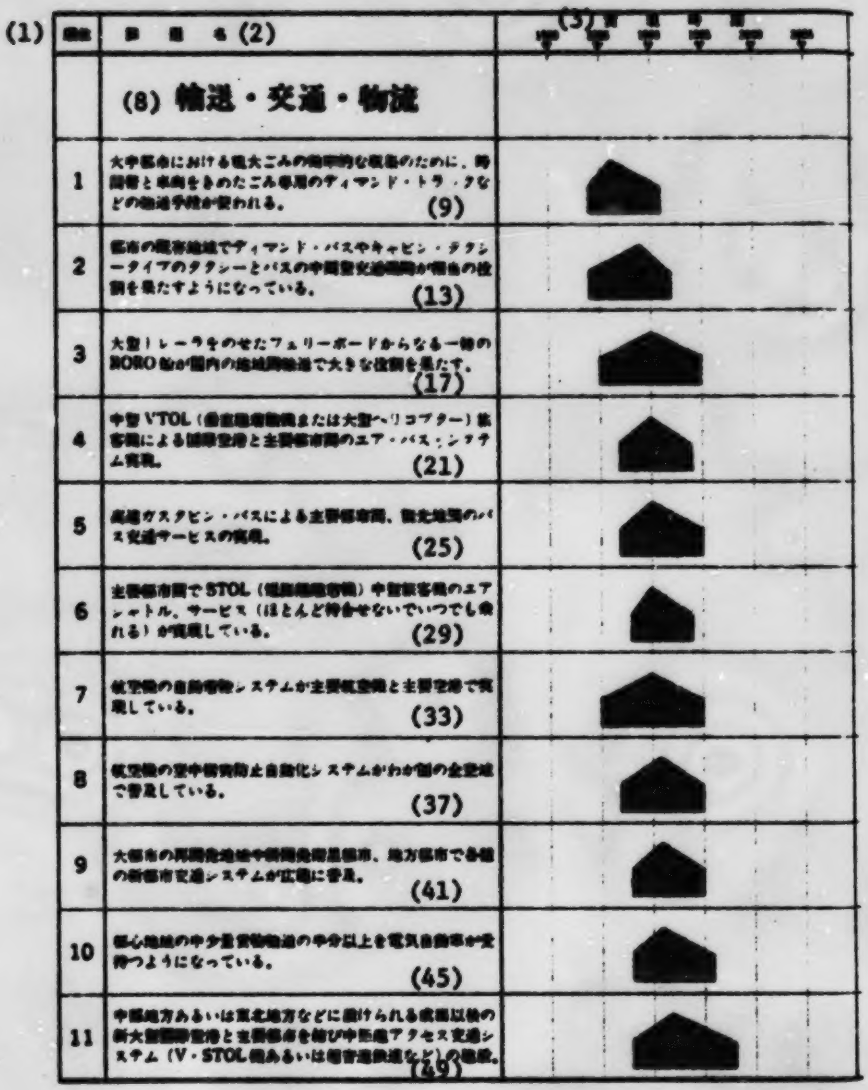


(1)		(2)	(3)
(4) 62(27%)	(5)	● [illegible]	19
	(6)	● [illegible]	33
	(7)	● [illegible]	8
(8) 110(47%)	(9)	● [illegible]	50
	(10)	● [illegible]	37
	(11)	● [illegible]	11
(12) 60(26%)	(13)	● [illegible]	39
	(14)	● [illegible]	8
	(15)	● [illegible] システム	23
(16) 232(100%)			

Key:

1. Transport and traffic environment
2. Excluding nonrespondents
3. Some duplications
4. Environment is worsening
5. Siting difficulties due to lack of land and people's movements
6. Physical limits of urban traffic are exposed
7. Delay in urban traffic technology innovation
8. Partially worsened
9. Internal city traffic alone is limiting
10. Air and sea traffic will expand but land traffic will be limited by land problems
11. Air and sea traffic become limiting
12. Environment is improving
13. Improvement through space redevelopment and new guidance control system
14. Contribution of new traffic means
15. Comprehensive transport system through optimum coupling of different traffic means
16. Total

[Table on securing space omitted]


(1)
(2)
(3)
(8) 輸送・交通・物流
1 (9)
2 (13)
3 (17)
4 (21)
5 (25)
6 (29)
7 (33)
8 (37)
9 (41)
10 (45)
11 (49)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Transportation, Traffic, Distribution
9. Special transport vehicles such as demand trucks will run at specified times using specially designated vehicles to efficiently collect large trash from medium and large cities
10. (+) organizational role of administration
11. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コメント (7)
87.5	0.72	(10) [illegible] (11)	[illegible] (12)
90.4	0.72	(14) [illegible] (15)	[illegible] (16)
69.8	0.67	(18) [illegible] (19)	[illegible] (20)
78.8	0.71	(22) [illegible] (23)	[illegible] (24)
73.5	0.68	(26) [illegible] (27)	[illegible] (28)
82.7	0.70	(30) [illegible] (31)	[illegible] STOL [illegible] (32)
96.2	0.74	(34) [illegible] (35)	[illegible] (36)
98.1	0.73	(38) [illegible] (39)	[illegible] (40)
98.1	0.72	(42) [illegible] (43)	[illegible] (44)
84.6	0.70	(46) [illegible] (47)	[illegible] (48)
71.2	0.68	(50) [illegible] (51)	[illegible] (52)

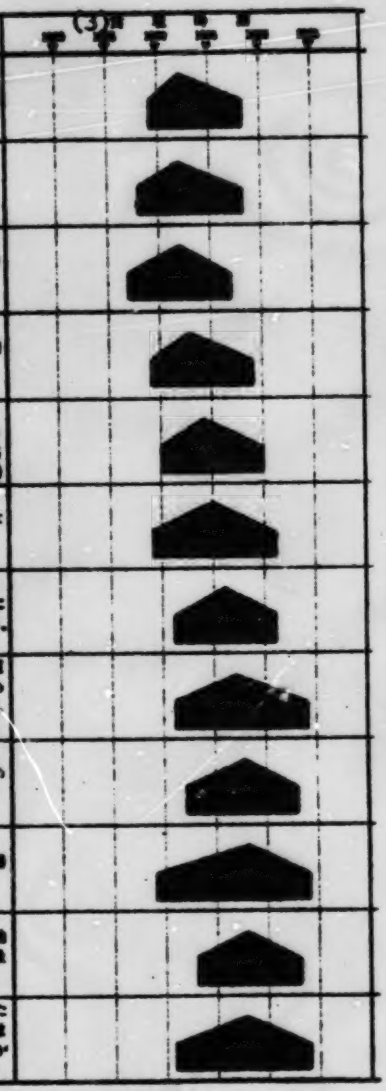
12. (E) preliminary breaker, preliminary compactor, simple loading device, demand bus, computer, microcompressor
    (B) terminal facility for demand truck with simple loading device.
    Demand bus facility for nighttime and early morning use
13. Intermediate traffic vehicles partway between demand bus and cabin taxi will begin to take up considerable traffic in already existing city areas
14. (+) organizational role of administration
15. (-) costs, investment, scale
16. (M) high specific strength material (aluminum, FRP)
    (E) intelligent terminal for vehicle loading
    (Sys) communication system
17. A certain type of RORO craft which is a ferry boat with large trailers on board will begin to play major role in domestic transport

[Key continued on following page]

18. (+) industry and firm efforts
19. (-) costs, investment, scale
20. (E) RORO large ferryboat, large trailer capable of multiple connections, large power tractor.
    Port facilities can be readily set up in rural and newly developed areas
21. Air bus system will materialize for use by tourists between international airports and principal cities using medium VTOL (vertical takeoff and landing craft or large helicopter)
22. (+) industry and firm efforts
23. (-) costs, investment, scale
24. (M) high specific strength composite material
    (E) light high output low noise engine to be used effectively as lift engine, wing structure capable of high float capacity
25. Appearance of bus transport service using high speed gas turbine for service between principal cities and tourist sites
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (M) heat, water, and corrosion resistant material (born nitride, silicon nitride, etc., or ceramics)
    (E) light high output gas turbine engine.
    Gas turbine vehicles will probably be practical as large vehicles such as bus and truck. They run at high speed and are quiet
29. Air shuttle service (with little waiting time) will be initiated between principal cities using STOL (short takeoff and landing plane)
30. (+) industry and firm efforts
31. (-) costs, investment, scale
32. (M) high specific strength composite material
    (E) STOL wing structure design. Large output light engine
33. Automated landing system will be installed on major aircraft and airports
34. (+) industry and firm efforts
35. (-) costs, investment, scale
36. (E) small high performance computer for aircraft, highly developed inertial guidance device for aircraft, 3-dimensional guide radar for wide area use, automatic control device, fail-safe system
    (Sys) flight control system through aircraft satellite
37. All planes in Japan will be equipped with automated system to prevent in-air collisions of aircraft
38. (+) research and development establishment efforts
39. (-) costs, investment, scale
40. (E) 3-dimensional plane discrimination radar for control center, 3-dimensional radar for aircraft, radar operating auto pilot, aircraft computer, development of system to use in effective manner Japan's narrow air corridor
41. Various new city traffic systems will be deployed in redeveloped areas of cities, newly developed satellite cities, and regional cities
42. (+) organisational role of administration
43. (-) costs, investment, scale
44. (M) high specific strength composite material (FRP, aluminum alloy, CFRP)
    (E) microcomputer (for vehicles), computer
    (Sys) computer cascade system communication system
    Role share of automobile traffic and new city traffic will probably be assumed naturally

[Key continued on following page]

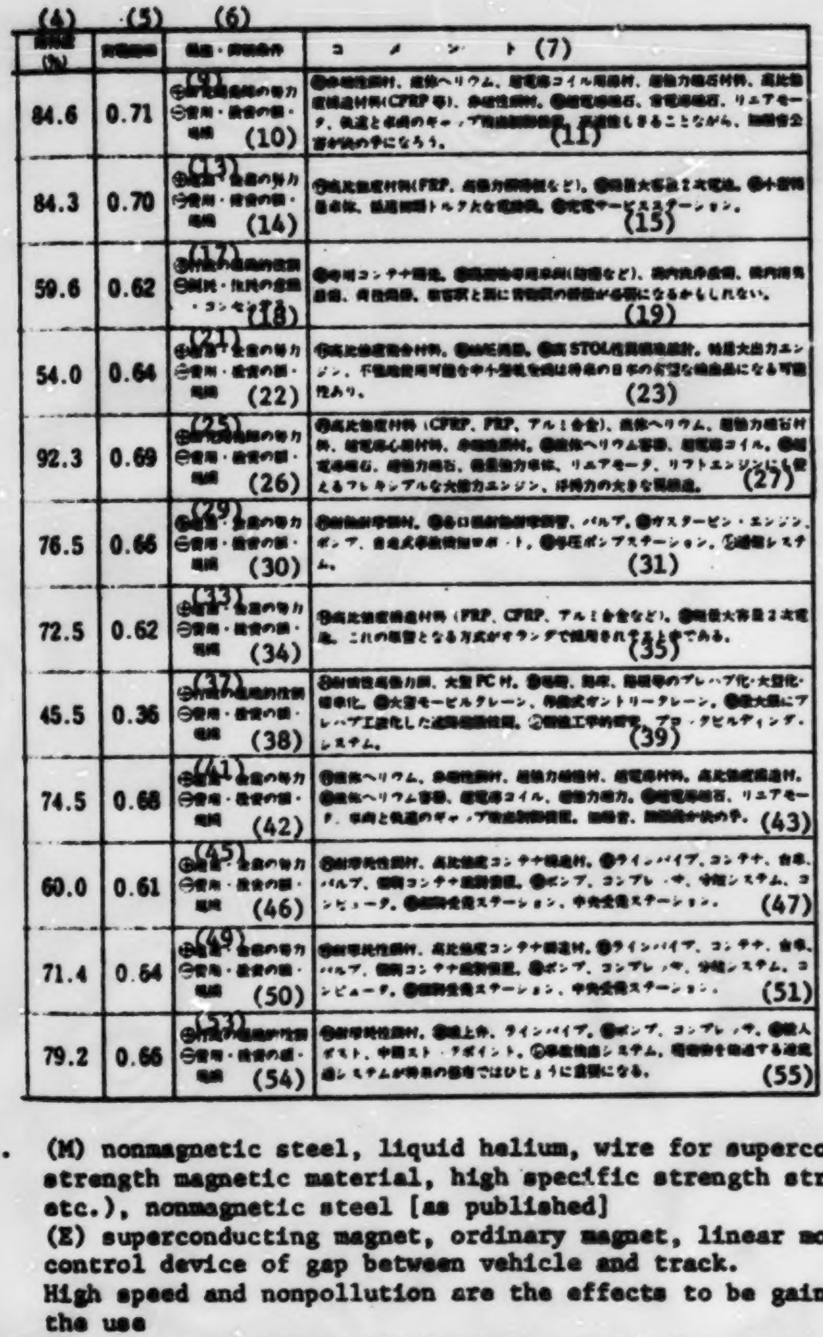
45. More than half of small package deliveries in the heart of cities will be by electric automobiles
46. (+) industry and firm efforts
47. (-) costs, investment, scale
48. (M) high specific strength construction material (FRP, high tensile strength steel plate, aluminum)
(C) light high capacity secondary battery
(E) light vehicle, low speed large initial torque electric motor
(B) charging service station
Electric automobiles will find wide application where land is flat and high speeds are not required
49. Construction of medium distance access traffic system (for VTOL craft or supersonic railway) to tie together new large international airports built after Narita and the principal cities where the airports are located in the Chubu or Tohoku district
50. (+) research and development establishment efforts
51. (-) costs, investment, scale
52. (M) high specific strength composite material (CFRP, etc.), liquid helium, nonmagnetic steel, superconducting wire, superconducting magnet material
(E) light high output low noise engine, wing construction with high floating effect, superconducting (or ordinary) magnet, linear motor



(1) [illegible]	[illegible] (2)
12	[illegible]（[illegible]）または[illegible]（[illegible]）のリニアモーターカーによる第二新幹線の実現（[illegible]公害）。 (8)
13	[illegible]のレンタカー・サービスで[illegible]がかなりの割合をしめるようになっている。 (12)
14	地下鉄の[illegible]が、[illegible]を通りかえす[illegible]や[illegible]を持ち込む[illegible]の有力な手段の一つになっている。 (16)
15	不[illegible]な[illegible]が内外の[illegible]にひろく用いられる。 (20)
16	[illegible]と[illegible]の中間に設けられる空港と[illegible]、[illegible]を結ぶ[illegible]（MSSTやリニアモーターカー）あるいは[illegible]（大型ヘリコプター・バスやV・STOL）の[illegible]アクセス[illegible]が重要な役割を果たしている。 (24)
17	石油、石油製品、石炭などの[illegible]の国内[illegible]の大半はパイプライン輸送になる。 (28)
18	都心地区で小型[illegible]、安全、低料金の電気自動車などによる[illegible]で自由なコミュニティ・カー方式が実用化される。 (32)
19	将来の[illegible]や[illegible]と住宅[illegible]を結ぶアクセス道路、バイパス等は、[illegible]10年、20年等とあらかじめ[illegible]をきめ、再配置、再建設しやすい[illegible]システムとして[illegible]から建設される。 (36)
20	超電導または、常電導の磁気浮上、リニアモーター式の[illegible]の実用化（[illegible]、[illegible]公害）。 (40)
21	[illegible]センターから[illegible]を無人で可能とする[illegible]システムが大型住宅団地や[illegible]で実現。 (44)
22	[illegible]、[illegible]センターと[illegible]などの間の[illegible]に地下チューブ[illegible]または真空[illegible]ラインがひろく普及している。 (48)
23	粗大ごみを除く都市ごみを[illegible]におかれた投入口にいれ、道路、高速道路に沿って[illegible]した[illegible]または真空輸送チューブでごみ処理場におくるシステムが実用化されている。 (52)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Superconducting (400-500 km/hr) or ordinary (200-300 km/hr) linear motor to drive second Shinkansen (express train) (nonnoise polluting)
9. (+) research and development establishment efforts
10. (-) costs, investment, scale



(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
84.6	0.71	(9) [illegible] (10)	[illegible] (11)
84.3	0.70	(13) [illegible] (14)	[illegible] (15)
59.6	0.62	(17) [illegible] (18)	[illegible] (19)
54.0	0.64	(21) [illegible] (22)	[illegible] (23)
92.3	0.69	(25) [illegible] (26)	[illegible] (27)
76.5	0.66	(29) [illegible] (30)	[illegible] (31)
72.5	0.62	(33) [illegible] (34)	[illegible] (35)
45.5	0.36	(37) [illegible] (38)	[illegible] (39)
74.5	0.68	(41) [illegible] (42)	[illegible] (43)
60.0	0.61	(45) [illegible] (46)	[illegible] (47)
71.4	0.64	(49) [illegible] (50)	[illegible] (51)
79.2	0.66	(53) [illegible] (54)	[illegible] (55)

11. (M) nonmagnetic steel, liquid helium, wire for superconducting coils, super strength magnetic material, high specific strength structural material (CFRP, etc.), nonmagnetic steel [as published]
    (E) superconducting magnet, ordinary magnet, linear motor, detection and control device of gap between vehicle and track.
    High speed and nonpollution are the effects to be gained that will determine the use
12. Electric automobiles will begin to account for a substantial fraction of rental cars
13. (+) industry and firm efforts
14. (-) costs, investment, scale

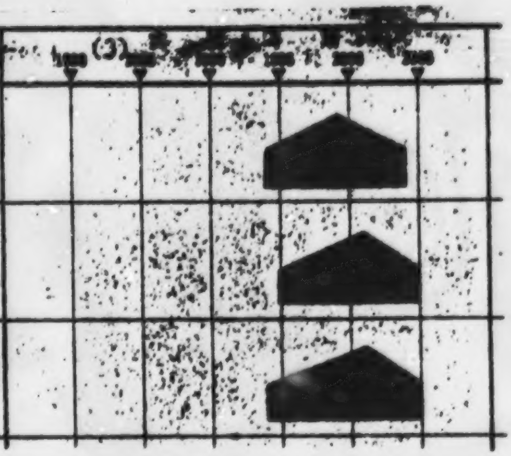
[Key continued on following page]

15. (M) high specific strength material (such as FRP, high tensile strength thin steel sheet)
(C) light large capacity secondary battery
(E) low speed large initial torque motor
(B) charging service station
16. Late night runs of subways will become effective means for shipping off wastes and bringing in consumer items
17. (+) organizational role of administration
18. (-) people's awareness, consensus
19. (C) special container development
(E) special waste vehicle (dustproofed), building cleaning device, building deodorizing device, loading device, and new facility for baggage handling apart from passenger depot may become necessary
20. Short takeoff and landing aircraft usable on irregular ground will be widely used to transport goods for domestic and foreign trade
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (M) high specific strength composite material
(C) hydraulic equipment
(E) high STOL type wing design, light large output engine
Medium and small aircraft for use on irregular ground may become promising export item of the future
24. Railroads tying together urban and suburban areas to airports located within the city or high speed access highways to aircraft service (provided by large helicopter bus or V·STOL) will play important role
25. (+) research and development establishment efforts
26. (-) costs, investment, scale
27. (M) high specific strength material (FRP, CFRP, aluminum alloy), liquid helium, super strength magnetic material, superconducting core wire, nonmagnetic steel
(C) liquid helium container, superconducting coil
(E) superconducting magnet, superstrength magnet, light and strong body, linear motor, flexible large thrust engine which can be used for lift engine, large wing structure with large lift power
28. Most of oil, oil products, and coal will be transported within the country through pipelines
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (M) corrosion and abrasion resistant steel
(C) corrosion and abrasion resistant steel pipe of varying diameter, valves
(E) gas turbine engine, pump, self-running accident detection robot
(B) pump stations
(Sys) communication system
32. Small nonpolluting, safe, and low cost electric automobiles will be used as community cars in urban centers which the user can leave for another to use
33. (+) industry and firm efforts
34. (-) costs, investment, scale
35. (M) high specific strength material (such as FRP, CFRP, aluminum alloy)
(C) light large capacity secondary battery
A prototype is being tested in Holland

[Key continued on following page]

36. Access roads tying together future high speed highways or trunk highways and residential streets and bypass roads will be constructed from the start under a provisional system where they can be relocated or reconstructed after 10 or 20 years' use
37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (M) weather resistant high tensile strength steel, large PC material
(C) prefab, large dimensioned, and standardized foundation, road bed, and road sections
(E) large mobile crane, mobile gantry crane
(B) road construction technology exploiting prefab construction to the maximum degree
(Sys) cost engineering research, block building system
40. Magnetic levitation by superconductive or ordinary mode linear motor powered new Shinkansen (express train) will be developed (super high speed, noiseless, vibrationless, nonpolluting)
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) liquid helium, nonmagnetic steel, super strength magnet material.
High specific strength construction material
(C) liquid helium container, superconducting coil, super strength magnetic force, linear motor, device for detecting gap between vehicle and track, noiseless and vibrationless features will be the deciding attributes
44. Terminal distribution system where unmanned delivery of items from local centers to individual homes will become practical in large residential parks and redevelopment areas
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (M) abrasion resistant steel, high specific strength container construction material
(C) line pipe, container, dolley, valve, individual container discriminating device
(E) pump, compressor, branching system, computer
(B) individual receiving stations, central receiving and transmitting station
48. Underground tubes powered by compressed air or vacuum will be used to deliver parcels between district depots or collection centers on local streets
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (M) abrasion resistant steel, high specific strength container construction material
(C) line pipe, container, dolley, valve, individual container discriminating device
(E) pump, compressor, branching system, computer
(B) individual receiving station, central receiving and transmitting station
52. Excepting large trash, urban trash will be first dumped at present-day collection units after which they will be transported to the disposal sites through compressed air or vacuum operated tubes installed alongside high speed highways
53. (+) organizational role of administration
54. (-) costs, investment, scale
55. (M) abrasion resistant steel
(C) reverse valve, line pipe
(E) pump, compressor
(B) injection post, intermediate stop point
(Sys) accident detection system.
Reverse distribution system for transporting waste will become very important to cities in the future

[illegible]	[illegible]
24	大口径の鋼管またはコンクリート管を埋設し、中を台車にコンテナをのせて圧送または真空輸送する貨物新幹線。(8)
25	大口径の鋼管またはコンクリート管を埋設し、中を広幅コンベヤーにコンテナをのせて連続輸送する貨物新幹線。(12)
26	関東平野の内陸深部、琵琶湖を経由する日本海と太平洋連絡とに、航洋ドライカーゴ、近海タンカーを通す大型運河が建設、利用されている。(EC、東欧圏では進行中)。(16)



Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Large diameter steel or concrete pipe will be installed through which dolleys loaded with containers will be moved by compressed air or vacuum as part of a parcel express system
9. (+) industry and firm efforts
10. (-) costs, investment, scale
11. (M) abrasion resistant steel, abrasion resistant concrete
    (C) large diameter pipe line, large diameter concrete line pipe, parcel container, truck, valve
    (E) pump, compressor, branching system
    (B) pipe line parcel transport system
12. Large diameter steel or concrete pipe will be installed in which a wide conveyer with containers is placed to continuously transport parcels as part of parcel express system
13. (+) industry and firm efforts
14. (-) costs, investment, scale
15. (M) weather resistant high tensile strength steel, PS concrete, high specific strength construction material
    (C) super wide conveyer belt, large and light container
    (E) super large conveyer system, branching system
    (B) large diameter tunnel
    (Sys) driving control automated system, alarm, disaster prevention system
16. Large canal will be constructed between the Japan Sea and the Pacific by way of Lake Biwa and into the inner reaches of the Kanto plain where dry cargo ships and tankers will ply

[illegible] (%)(4	実現確率 (5)	促進・抑制条件 (6)	コメント (7)
56.0	0.61	(9) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (10)	Ⓜ耐摩耗性鋼材、耐摩耗性コンクリート。Ⓔ大口径パイプライン、大口径コンクリートラインパイプ、貨物コンテナ、台車、バルブ。●ポンプ、コンプレッサ、分岐システム。●パイプライン式貨物新幹線。 (11)
52.1	0.61	(13) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (14)	Ⓜ耐候性高張力鋼、PSコンクリート、高比強度構造材料。●超広幅コンベヤベルト、大型軽量コンテナ。●超大型コンベヤ・システム、分岐システム。●大口径トンネル。Ⓢ運転自動制御システム、警報・防災システム。 (15)
49.0	0.36	(17) ⊕政治の組織的役割 ⊖費用・投資の額・規模 (18)	Ⓜ各種安全高性能爆薬、耐海水性コンクリート、耐海水性鋼、耐候性鋼。●超大型掘削機、超大型水門機器、超大型ポンプ、超大型ベルトコンベヤ。●定向爆破土砂移動土木工事、堤防工事。Ⓢ地質調査、土質調査、TA、水理水文調査。運河の重要性が世界的に見直されている。 (19)

17. (+) political organizational role
18. (-) costs, investment, scale
19. (M) various safe high performance explosives, sea water resistant concrete, sea water resistant steel, weather resistant steel
    (E) super large excavation machine, super large water gate, super large pump, super large belt conveyer
    (B) directional explosive-moved dirt displacement project, embankment project
    (Ser) geologic survey, soil survey, TA, hydraulic, hydrologic survey
    Importance of rivers as transport medium is being reassessed throughout the world

2267
CSO: 8129/1906

PLACE EMPHASIS ON IMPROVING HEALTH POLICIES AND PREPARE FOR OLD AGE SOCIETY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 98-107

[Article by Hironuma Ono]

[Text] Medical Treatment and Welfare

Grave Lack of Medical Treatment Labor

Japan which has realized high economic growth of a rate unparalleled in the history of the world accomplished this with a labor force dominated by the young, but the population structure is expected to quickly become old in a short time.

Where the Western countries required between 100 and 200 years to develop an old population following the industrial revolution, Japan has developed this old society in a matter of 20-30 years, and this process has brought up a number of problems.

As the shift to an aged population structure is being made, the demands for medical treatment per population unit increases. In addition, the rate of patient load and sick incidence increases with the greater crowding of urban living and industrial activity (it is estimated that Japan's annual demand for medical treatment exceeds 10 trillion yen).

The training of doctors and nurses has not kept pace with this high growth process, and a lack of labor in the medical area has become apparent. In line with the sudden increase in demand for medical treatment, paramedical workers (such as nurses, physiological, and pathological related technologists) along with cases of extra heavy labor have appeared on the scene. Due to the effect of this, paramedical personnel have decreased, and the bad situation of the lack of labor in medical treatment area has become even more pressing. Even while new hospitals with high level of sophisticated instrumentation are continually being constructed, these are sometimes unable to open because of their lack of paramedical help.

Along the lines of the daily living front and the industrial activity front, the wide use of convenient automobiles and good roads have resulted in a sharp rise in traffic accidents. These accident victims and the victims of other phases of urban living have placed severe demands on the capability of the city's medical force, and the grave situation exists that the medical profession is unable to catch up.

There also has been the accelerated displacement of population from the agricultural villages to the large cities, and seasonal industries have generated excessively neglected areas all over the country. These areas are populated mainly by the aged and children which constitute the age brackets with the greatest need for medical care. Now these patients are usually removed from cities where accessibility to information and the latest research results are readily obtained such that the doctors are loathe to practice there. These areas are now being serviced mainly by doctors from Korea and Taiwan, and this is the situation today.

Society's margin of consideration afforded by economic growth for the welfare of people physically has dropped and victims of severe illness and the increasing awareness of the people to the matter of welfare are not adequate as yet, but this is an important trend in this country's social policy history. While their numbers may be small, the manner in which people recuperating from bodily injury or serious illness or the aged individual and weakened patients are cared for is an important item any member of a healthy and complete society must ponder over. It is thought that this subject plays an important role in sustaining and strengthening social awareness that is the ultimate foundation of the nation's structure.

Reform of the [legal] system and the raising in levels of all of society's considerations and social consciousness are most important to elevating the welfare levels of society. Now these require a long time and instructional activities, and there are still many areas where self-sacrifice on the part of dedicated welfare workers is playing a major role. There must be effort to reduce this [need for] dedicated labor. There is also a need to develop, improve, and popularize various high performance artifacts to aid these handicapped and infirm people to bring them as close as possible to their normal state.

Among those people who carry serious handicaps such as the physically handicapped and the infirm, there are a great many, certainly much more than normally expected, who aspire not only to maintain their own living but contribute to the welfare of others and society. At the same time, it is thought that society's considerations in this direction contribute toward strengthening social awareness on the part of the healthy. In order to respond to the hopes of these people who try to compensate as much as possible for their handicaps and carry their load, there is a need for system reform and enlightenment on the social awareness front among the healthy. At the same time, highly specialized auxiliary tools, working tools, and tools for their daily living need to be developed.

Setting Up Programs for Promoting Health

The average lifetime of the Japanese has been increasing steadily since the last war, and the fact that this country ranks with the top in the world in the matter of its average age is something to rejoice over. On the other hand, the morbidity rate of this country's middle-age and older people is very high on a worldwide scale. People who do not die but are not healthy are increasing in number. This is a bad situation both for those individuals and for society. It would be ideal if this extended life were accompanied by good physical and mental health such that deaths are only the result of old age.

It is said that Japan's demand for medical services at the present time accounts for about 5 percent of the gross national product (GNP), but this increase in number of people who do not die and are not in good state of health has resulted in a sharp increase in this number. On a worldwide basis, it is said that Sweden and the United States allot about 10 percent of their GNP to medical treatment, but any such occurrence tends to brake that country's overall economic growth. The continual increase in demand for medical services indicates that the health level of the people is retrogressing in a bad direction (to be sure, another possibility is that the quality of medical treatment is increasing as a result of which greater costs are involved). Should these increasing medical costs brake the overall economy, it cannot be ignored that resources available for medical purposes will also decrease.

When considered from such viewpoints, the important subject becomes not how to treat one when he becomes sick but that every individual and society overall take great pains to prevent becoming ill, maintain one's health, and conjure up policies which will enhance such efforts. At the same time, prevention of diseases becomes a very important subject. It is expected that people of age 65 or greater will take up more than 10 percent of the total population in 20-30 years, showing the rapid shift to an aged society (this also infers a transition to a society with high latent demand for medical services). This is a subject which cannot be overemphasized in Japan.

This is why there is need for methods, facilities, and equipment to discover a disease even at the stage the individual is still not aware he has the disease (the costs are less both to the individual and to society should a disease be detected at an early stage) and to promote and maintain health along with publicizing the results of technological research and development.

A member of the general public must not only be able to know his health status in simple and reliable manner but should take measures to improve his health such as through sports activity in line with his age and health status. Should such a program and facilities be set up, not only the individual but society itself would benefit. Should the average age come to be greatly extended as today, and in the future become even more advanced and advances in overall health and accompanying decrease the demand for medical services, the situation will be fortunate for the individual and economically advantageous to society.

Mobilize the World's Physicians by Radio

The technological development subject groups corresponding to this qualitative and quantitative increase in need for increasing medical treatment, welfare, and health have been classified in the following manner: 1) diagnostic and treatment subject group, 2) recuperation and welfare subject group. The former includes a) improvement in diagnostic level and assurance of availability, b) increase in level of treatment services and technology development subjects designed to improve availability while the latter includes a) promotion of return of handicapped and infirm patients to society, b) qualitative and quantitative improvements in welfare technology levels, and c) technology development subject group for promoting health.

Let us now look at the periods when the various events can be expected to materialize based on the results of the present technology predictions.

The subject group of improvement in diagnostic and treatment levels and the assurance of availability under 1) is expected to see screening tests such as for cancer using automated graphic processing of the results of X-ray examination equipment for various types of tests periodically in automated manner and with minimum intrusion into the patient programmed in line with the patient's status will be expected to appear in the 1981-1985 period.

The 1986-1990 period is expected to see the emergence of toxic information search centers which a physician can contact by telephone, small hospitals and hospital automation system where an individual diagnostic station can be utilized, local health diagnostic system, and check methods by which the patient's data can be used to predict events that will take place in the future. Hospital automation where the functions of medium and large hospitals, physiological and pathological examinations, tests, and data analysis can be handled is expected to become commonplace. Wide area blood supply system and development of mechanized, automated, and systematized treatment processes are required to compensate for shortages of hospital labor. Establishment of treatment for cancer, mycosis, and viral serious diseases and development of a surgical simulator for medical training are desirable.

On-line real time information systems by which a physician can obtain new information through telephone and development and improvement of data banks to store data related to a patient's condition and thesauri and algorithms to aid the search for the data also are expected to be developed along about 1991-1995.

The 1991-1995 period is expected to see the most recent treatment methods, toxic effects of various agents, effect of agents found throughout the world, and side-effect related information become accessible by telephone through an on-line real time system. In addition, hospital automation systems for small hospitals and individual diagnostic station and home-use artificial organ facilities are expected to find wide use.

The period between 1996-2000 is expected to see specially difficult cases be treated with consultations with the world's leading specialists through satellite communication and data communication. Free splicing of nerve tissue, resolution or rejection reactions, and organ regeneration using organ cells and culture technology are expected to make their appearance.

Artificial Nerves and Muscles Will Appear

Along about 2001-2005 should see gene modification methods enable treatment of hereditary diseases, elucidation of life and aging processes, appearance of artificial nerves, and appearance of high level artificial muscles.

The technology subject group under 2) for the promotion of return of the handicapped and infirm back to society and promotion of welfare and health of injured and sick should see the use of periodic circuit health and diagnostic mobile vans to cater to workers hurt on a job and the very aged and quickly diagnose their condition. Periodic service for health diagnosis for the aged living alone and unable to visit clinics and periodic circuit bath services will become systematized. The motor capabilities of adults and individual sports training program will be planned and development of public facilities and equipment and their popular use are highly desirable.

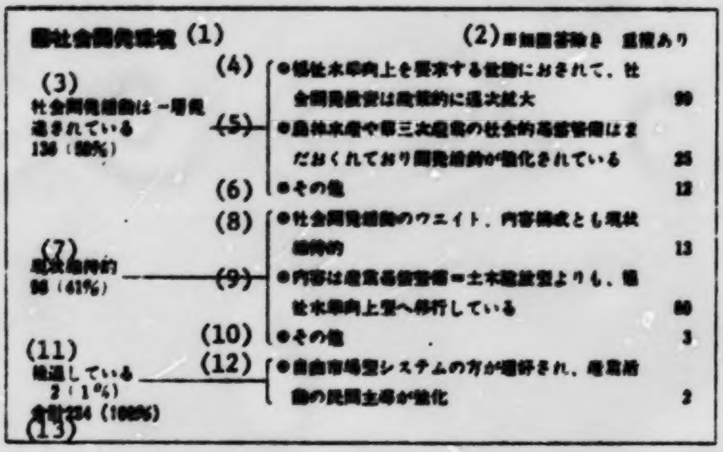
The 5-year period from 1986-1990 should be the period when the functions of various sensory organs and intent display organs be replaced to considerable degree by high class instruments reflecting the newest in electronic and information technology. Patients recuperating from serious diseases and seriously injured patients will be located in public homes designed to minimize their functional handicaps.

The measurement of body condition, determination of suitable occupation, judgment of work capability, and training of physical capabilities of physically handicapped and aged people along with the equipment, facilities, and sundry matters need to be developed. Suitable quarters for the handicapped and the aged and development of plants for a wide range of utilizations are necessary. At the same time, braille publications, artificial sight, and hearing aids should be brought up to a high level through the exploitation of electronic and information technology and made practical. The public and private sector setting up businesses for conducting individual sports and physical training guidance is highly desirable.

The 1991-1995 period is expected to see the appearance of equipment, monitors for homes of the physically impaired, and special beds provided for relieving the lives of seriously injured people or patients with severely withered muscles and the use of high class equipment to operate artificial limbs, brain, and neurophysiological functions and electronic and servomechanisms which operate under the command of the brain through the medium of microprocessors and electrical power or gas pressure. With emphasis on prevention of intrusion on privacy, a citizen's health number for his health training program and long term outdoor sport facilities will be provided.

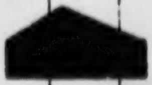
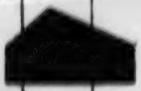
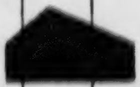
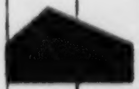
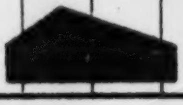
It is expected that a free or low cost telephone box style health diagnosis facility where unmanned health diagnostic service will be provided will make its appearance in the 1996-2000 era.

The above can be realized after practicalization has proceeded and large scale dispersion stage is attained, and there is need to study the technological development subjects in the order of the developmental needs after giving due allowance for lead time.


■社会開発環境 (1)
(2) ※無回答除き 重複あり
(3) 社会開発活動は一層推進されている 136 (58%)
(4) ●福祉水準向上を要求する世論におされて，社会開発投資は趨勢的に逐次拡大 90
(5) ●農林水産や第三次産業の社会的基盤整備はまだおくれており開発活動が強化されている 25
(6) ●その他 12
(7) 現状維持的 96 (41%)
(8) ●社会開発活動のウエイト，内容構成とも現状維持的 13
(9) ●内容は産業基盤整備＝土木建設型よりも，福祉水準向上型へ移行している 80
(10) ●その他 3
(11) 後退している 2 (1%)
(12) ●自由市場型システムの方が選好され，産業活動の民間主導が強化 2
(13) 合計234 (100%)

Key:

1. Social development environment
2. Excluding nonrespondents, some duplication
3. Social development activities will proceed even faster
4. Funds for social development will increase due to increased public opinion for improvement in welfare levels
5. Social base facilities for agriculture, forestry, and fisheries and for tertiary industrial use are delayed, and developmental activities are being reinforced
6. Other
7. Is presently being maintained
8. Weight of social development activity and internal makeup are presently being maintained
9. There is a trend for improving welfare more than for industrial base provision - engineering projects
10. Other
11. Is retrogressing
12. A free market system is favored, and private initiative in industrial activities should be reinforced
13. Total

(1) 番号	課題名 (2)	(3) 実現時期 1980 1985 1990 1995 2000 2005
	(8) **診断・治療**	
1	患者のことをよく考えて病院のシステム設計を行なうことが普通になっている。 (9)	
2	輸血用血液の広域（全国的）供給体制が制度化されている。 (13)	
3	有病率の高い地域に住む主婦、老人、農漁民、商店など自営者のための設備のととのった検診車と地域検診センターからなる地域健康診断システムの実現。 (17)	
4	社会の高齢化、生活パターンの変化にともない有病率と治療需要がふえるのに医師、看護婦は十分確保できないので、医療のシステム化、省力化、機械化、自動化が進む。 (21)	
5	特殊血液型患者と提供者のデータバンクが全国的、世界的に整備されている。 (25)	

Key:

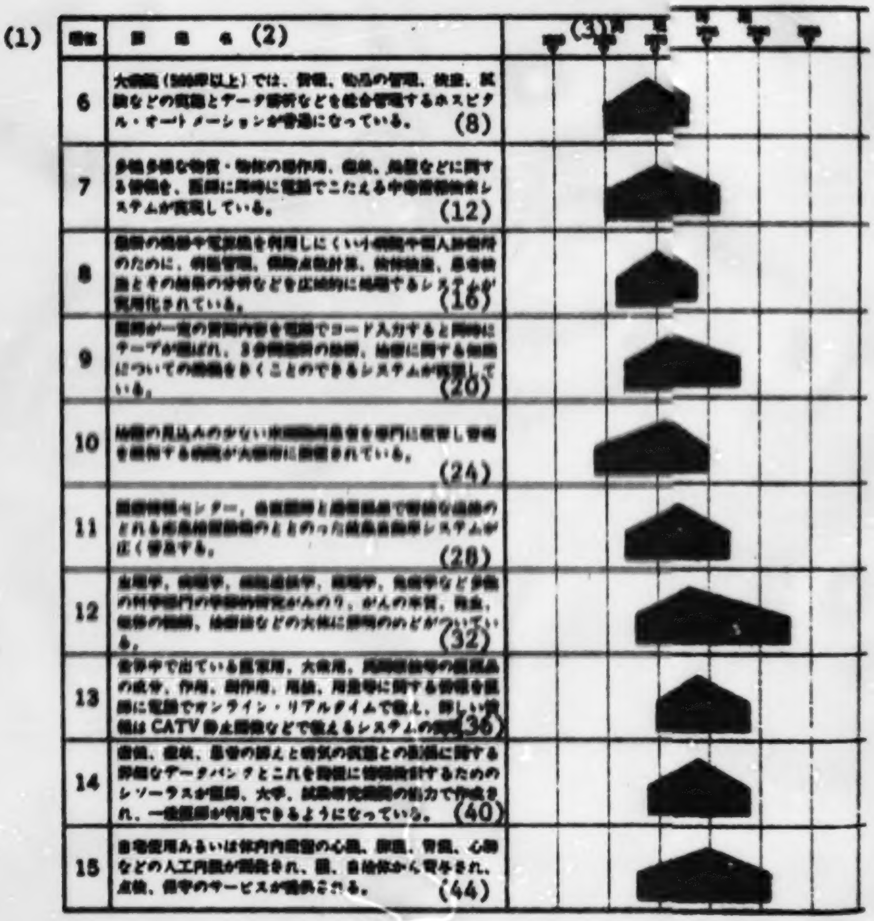
1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Diagnosis, Treatment
9. Hospital system design which takes the patient under consideration becomes commonplace
10. (+) people's awareness, consensus
11. (-) costs, investment, scale
12. (M) bed material, wall material improvement
(E) improvement of air conditioning system, improvement of elevators and escalators, improvement of stretchers and wheel chairs
(S) patient ergonomic design for hospitals
(Sys) patient ergonomic process control system
13. Wide area (countrywide) blood supply system becomes systematized
14. (+) people's awareness, consensus
15. (-) costs, investment, scale
16. (C) refrigerated container for blood transport
(E) refrigerator car for blood storage, helicopter for blood transport, high-speed off-road vehicles (4-wheeled drive, snow mobiles, high speed boat)
(Sys) communication system

期待度 (%) (4)	(5) 実現確率	(6) 促進・阻害条件	コ メ ン ト (7)
93.5	0.73	(10) ⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (11)	Ⓜ素材料・塗材料等の改良。Ⓔ空調システムの改良、エレベータやエスカレータ等の改良、ストレッチャ・車椅子の改良。Ⓢ患者人間工学的病院設計。Ⓢ患者人間工学的工程管理システム。 (12)
95.7	0.74	(14) ⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (15)	Ⓔ血液輸送用冷蔵コンテナ、Ⓔ血液貯蔵用冷蔵庫、血液輸送用ヘリコプタ・高速機動性輸送機器（救急自動車、雪上車、高速艇）。Ⓢ通信システム。 (16)
95.8	0.74	(18) ⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (19)	Ⓜ分析試薬。Ⓔ多チャンネル自動生化学分析装置、ミニコンピュータ、X線装置、超音波装置、電源装置、バス。ⒺME機器、MODEM。Ⓢ各種生理・病理・生化学判断アルゴリズム。医療費増加の傾向に対応するためには先手、先手が必要。 (20)
93.5	0.71	(22) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (23)	Ⓔ油圧機器、空気圧機器、各種センサ。Ⓢ省力型ストレッチャ、省力型ベッド、ナース・ロボット、病状集中監視システム、エア・フィルム患者移動装置、インテリジェント・ターミナル、コンピュータ。 (24)
95.7	0.71	(26) ⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (27)	Ⓔコンピュータ、インテリジェント・ターミナル。Ⓢデータファイル・システム、データバンク・システム、データ通信システム。オランダに本部をおく一応の世界組織ができている。 (28)

17. Appearance of district health diagnostic system employing diagnostic vehicles and a district diagnostic center to cater to self-employed such as housewives, aged, farmers, fishermen and shopkeepers who live in areas of high rate of sickness
18. (+) people's awareness, consensus
19. (-) costs, investment, scale
20. (M) analytical reagents
    (E) multichannel automated biochemical analysis equipment, minicomputer, X-ray unit, ultrasonic device, power source, bus
    (E) ME equipment, MODEM
    (Sys) various physiological, pathological, biochemical determination algorithms. Initiative to counter the rapid increase in medical costs is necessary
21. Despite the increases in morbidity rate and demand for treatment accompanying changing living patterns and aging structure of society, the number of doctors and nurses has not kept pace, and systematization, mechanization, and automation of treatment are promoted
22. (+) organizational role of administration
23. (-) costs, investment, scale
24. (E) hydraulic equipment, compressed air equipment, various sensors
    (Sys) power conserving stretcher, power conserving bed, nurse robot, centralized observation system, air-film patient transporter, intelligent terminal, computer

[Key continued on following page]

25. Data banks for special blood diseases and similar ailments are established in countryside and worldwide manner
26. (+) people's awareness, consensus
27. (-) costs, investment, scale
28. (E) computer, intelligent terminal
(Sys) data file system, data bank system, data communication system, a worldwide system provisionally based in Holland will be established



(1)	(2)
6	[illegible] (8)
7	[illegible] (12)
8	[illegible] (16)
9	[illegible] (20)
10	[illegible] (24)
11	[illegible] (28)
12	[illegible] (32)
13	[illegible] (36)
14	[illegible] (40)
15	[illegible] (44)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Hospital automation will become commonplace in large hospitals (500 beds or more) which will comprehensively gather information, control supplies, and execute inspections and tests and perform data analysis
9. (+) industry and firm efforts
10. (−) costs, investment, scale
11. (C) specimen enclosing container
    (E) intelligent terminal for doctors, specimen enclosing device, multi-channel automated biochemical analysis facility, minicomputer, computer, MODEM
    (Sys) software for numerical and medical history management, software for automated analysis communication system
12. Information concerning toxicity, disease causes, and handling of various materials will be obtained by telephone from a physician directly in the toxicity information search system which will be developed

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]・[illegible]	コ メ ン ト (7)
93.6	0.73	(9) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (10)	ⓒ[illegible]、ⓔ医者用インテリジェント・ターミナル、[illegible]、多チャンネル自動生化学分析装置、ミニコンピュータ、コンピュータ、MODEM、ⓢ点数計算・病歴管理ソフトウェア、自動分析ソフトウェア、通信システム。 (11)
77.1	0.69	(13) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (14)	ⓔ高度音声合成システム、音声パターン認識入力システム、コンピュータ、ⓢ全国的・国際的なデータファイル・システム、全国的・国際的なデータバンク・システム（[illegible]・[illegible]レソーラス、[illegible]システムを含む）、通信システム。[illegible]の花粉、[illegible]などによるアレルギー性の病気などに有効。 (15)
95.8	0.70	(17) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (18)	ⓒ[illegible]、ⓔ医者用インテリジェント・ターミナル、[illegible]、多チャンネル自動生化学分析装置、ミニコンピュータ、コンピュータ、MODEM、ⓢ点数計算・病歴管理ソフトウェア、自動分析ソフトウェア、通信システム。 (19)
72.3	0.67	(21) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (22)	ⓒ巨大な磁気ディスクが必要、ⓔ押しボタン式電話、音響カップリング装置、データ[illegible]、コンピュータ、音声合成装置、ⓢ使いやすい[illegible]システム、シソーラス、データファイル、データバンクの作成と維持。 (23)
93.6	0.75	(25) ⊕行政の組織的役割 ⊕[illegible]・[illegible]の意識・コンセンサス (26)	ⓔ[illegible]、[illegible]（[illegible]を中心とする）。 (27)
82.2	0.69	(29) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (30)	ⓔ[illegible]・血圧、ⓔ[illegible]、[illegible]（[illegible]、心臓マッサージ等）、[illegible]、[illegible]ストレッチャ、ⓢ[illegible]システム。 (31)
100.0	0.74	(33) ⊕研究開発の努力 ⊖費用・投資の額・規模 (34)	ⓒ抗がん剤、制がん剤、がんワクチン、[illegible]、ⓔ中性子照射装置、中間子照射装置、ガンマ線照射装置、ⓢ[illegible]・[illegible]・[illegible]・[illegible]・免疫学などの学際的共同研究。 (35)
62.5	0.65	(37) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (38)	ⓒ巨大な磁気ディスク・[illegible]メモリ、ⓔデータ[illegible]、コンピュータ、音声合成装置、ⓢ使いやすい[illegible]システム、データバンクの作成と維持、メーカー・[illegible]・病院・官庁等に対する[illegible]づけ制度、データバンクをつねに更新していけばキノホルム[illegible]などが防げる？ (39)
93.6	0.70	(41) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (42)	ⓢ[illegible]・病院・大学・[illegible]の共同研究、シソーラス、アルゴリズム。 (43)
9˙06	0.68	(45) ⊕研究開発の努力 ⊖費用・投資の額・規模 (46)	ⓒ拒絶反応をおこさず人体になじむ材料、[illegible]、高性能[illegible]、人工血液、ⓔ超小型電池、人造血管、センサ、シャント・システム、ⓢ[illegible]または内蔵型の人工臓器、マイクロコンピュータ、マイクロポンプ、自動制御注入装置、高齢化傾向が強まるにつれて人工臓器の需要も増加しよう。 (47)

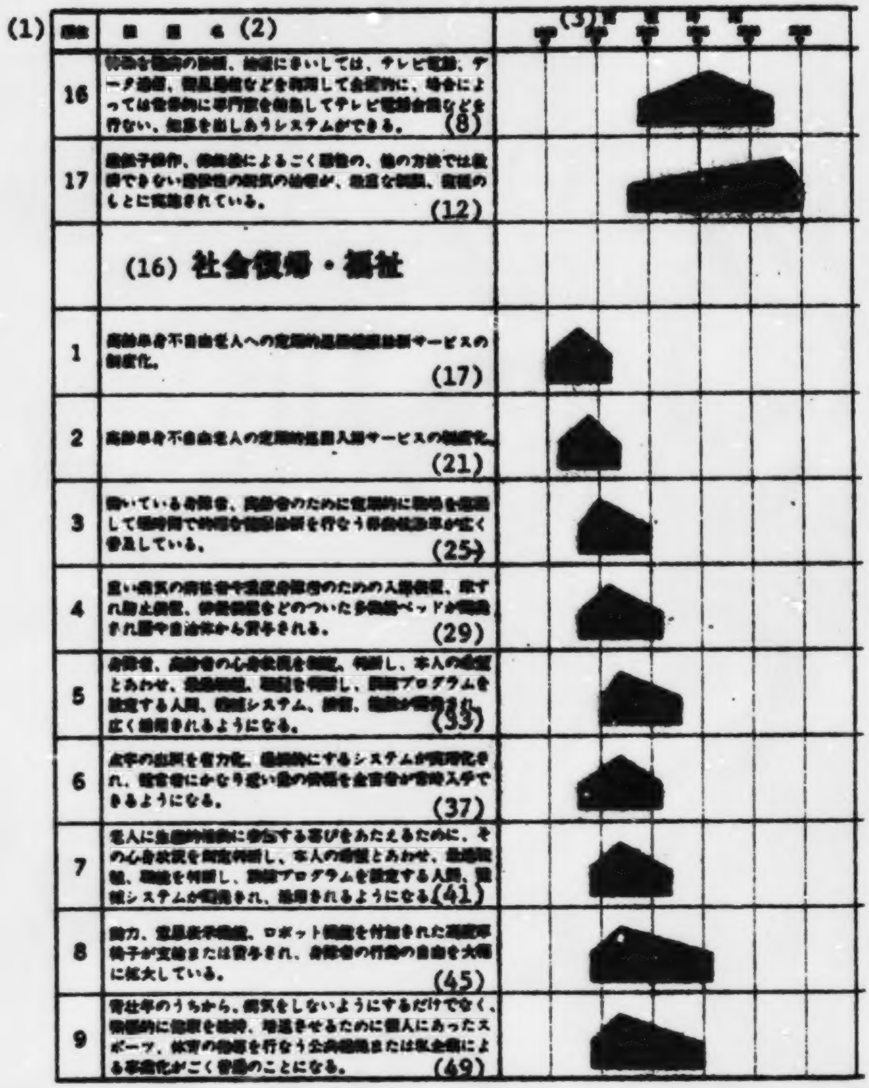
13. (+) organizational role of administration
14. (-) costs, investment, scale
15. (E) high level voice synthesis system, voice pattern recognition input system, computer
(Sys) countrywide and worldwide data file system, countrywide and worldwide data bank system (including medical treatment and drug information thesaurus), communication system.
Effective against pollen and pest allergies covering the four seasons
16. A system to effect medical history control, test calculations, body examinations, and patient examinations to cover wide areas will be established to aid small hospitals and individual diagnostic offices where it is difficult to use the most recent equipment and computers
17. (+) organizational role of administration
18. (-) costs, investment, scale
19. (C) specimen enclosing container
(E) intelligent terminal for doctors, specimen enclosing device, multichannel automated biochemical analysis facility, minicomputer, computer, MODEM
(Sys) numerical and medical histories management software, automated analysis software, communication system

[Key continued on following page]

20. Physicians input the contents of answers to questions by code from which data are selected instantly to furnish information on diagnosis and treatment within 3 minutes in the system that will become practical
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (C) very large magnetic disks are required
(E) push botton telephone, sound coupling device, data communication circuit network, computer, sound synthesis device
(Sys) easy to use information search system, thesaurus, data file, data bank compiling and maintenance
24. Hospitals to accommodate and ease the pains of hopelessly ill patients will be established in large cities
25. (+) organizational role of administration
26. (-) costs, investment, scale
27. (E) close patient observation device, concentrated treatment facility (directed mainly at easing pain)
28. Emergency treatment vehicle systems where close communication with medical treatment information center and direct dialog with a physician are maintained and with well equipped treatment capabilities will become popular
29. (+) organizational role of administration
30. (-) costs, investment, scale
31. (M) high quality artificial blood and plasma
(E) vehicle borne high-level patient observation facility (with oxygen and heart massage unit, etc.), communication equipment, high performance stretcher
(Sys) emergency medical treatment information system
32. Research in various disciplines such as physiology, pathology, cytogenetics, pharmacology, and immunology is directed at establishing the nature of cancer, its causes, transfer mechanism, and treatment methods
33. (+) research and development establishment efforts
34. (-) costs, investment, scale
35. (M) anticarcinogen, cancer suppressant, cancer vaccine, RI treatment agents
(E) neutron irradiation equipment, meson irradiation equipment, gamma ray irradiation equipment
(Sys) academic joint research on physiology, pathology, cytogenetics, pharmacology, and immunology
36. Emergence of a system which transmits information available in the world on the components, effects, side effects, methods of application, and doses of drugs for medical use, public use, and private use can be obtained from a physician by telephone through on-line real time dialog with details being given on stationary pictures on CATV
37. (+) industry and firm efforts
38. (-) costs, investment, scale
39. (C) very large magnetic disks, image memory
(E) data communication circuit network, computer, voice synthesizer
(Sys) easy to use information search system, compilation and maintenance of data bank assignment to provide information to practicing physicians, hospitals, government offices.
Quinoform incident might not have occurred had data banks been updated.

[Key continued on following page]

40. Data banks where information related to the nature of the malady and the patient's complaints are filed and thesaurus to simplify the search will be compiled by cooperation of physicians, universities, and research organs and made available to all physicians
41. (+) organizational role of administration
42. (-) costs, investment, scale
43. (Sys) joint research between practicing physicians, hospitals, universities, and experimental research organs, thesaurus, algorithms
44. Artificial organs are developed for home use such as heart, pancreas, kidney, or lung to be purchased by the country or self-governing bodies and provided with inspection and maintenance service
45. (+) research and development establishment efforts
46. (-) costs, investment, scale
47. (M) materials suited to humans which do not cause rejection reactions, reverse osmosis membrane, high performance adsorbant, artificial blood
(C) very small battery, artificial artery, sensor, shunt system
(E) portable or internally installed artificial organs, microcomputers, micropumps, automatically controlled injection device.
High age trend becomes stronger, and demand for artificial organs may increase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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. TV phone, data communication, and satellite communication will be utilized to provide nationwide and at times worldwide accessibility of specialists to diagnose and treat particularly difficult cases, and a system with intelligence will be created
9. (+) research and development establishment efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
85.4	0.65	(9) [illegible] (10)	[illegible] (11)
64.2	0.64	(13) [illegible] (14)	[illegible] (15)
100.0	0.81	(18) [illegible] (19)	[illegible] (20)
100.0	0.75	(22) [illegible] (23)	[illegible] (24)
98.1	0.75	(26) [illegible] (27)	[illegible] (28)
100.0	0.73	(30) [illegible] (31)	[illegible] (32)
94.1	0.72	(34) [illegible] (35)	[illegible] (36)
94.3	0.74	(38) [illegible] (39)	[illegible] (40)
86.3	0.71	(42) [illegible] (43)	[illegible] (44)
94.4	0.73	(46) [illegible] (47)	[illegible] (48)
89.6	0.71	(50) [illegible] (51)	[illegible] (52)

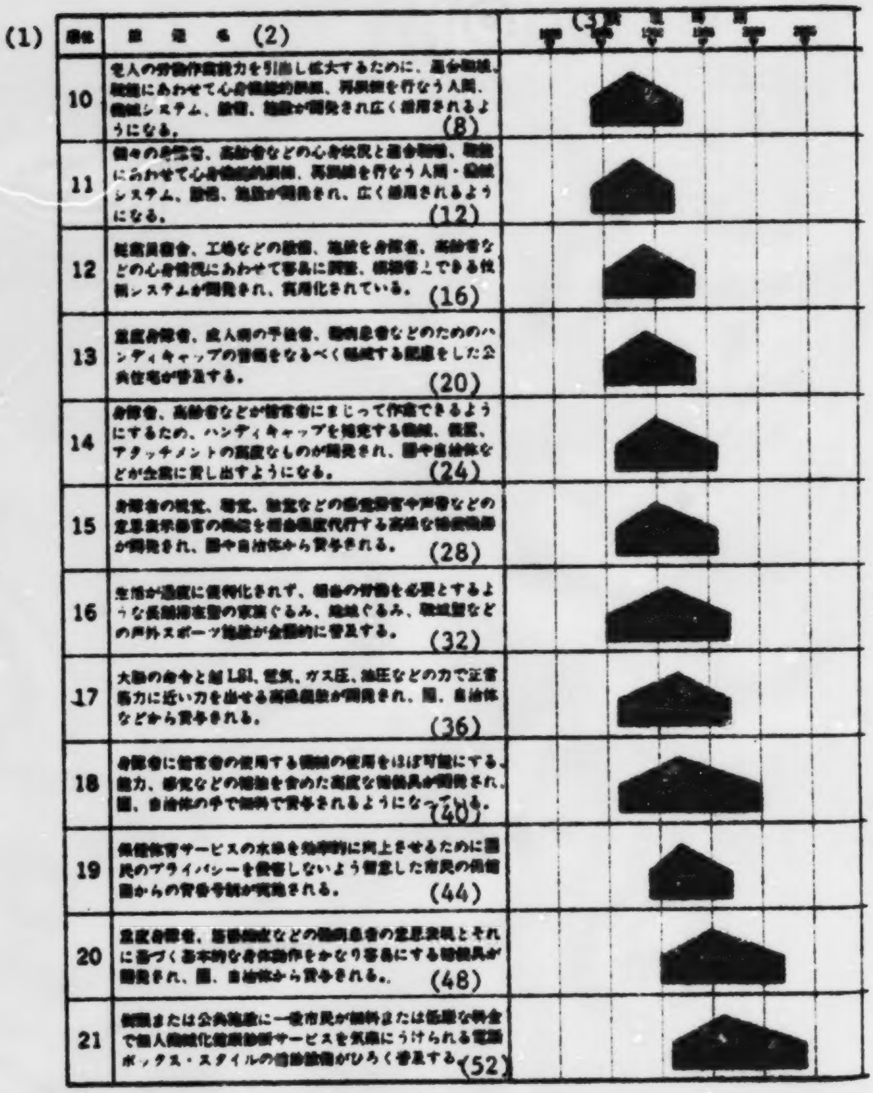
11. (E) TV telephone system, data communication system
(Sys) communication satellite system, intercountry simultaneous translation system, development and improvement of cost evaluation and economic systems, medical information is made comparatively easily accessible nationwide and worldwide
12. The treatment of hereditary diseases where other methods fail to remove bad traits will be performed by gene manipulation under conditions of strictest control and limitations
13. (+) research and development establishment efforts
14. (-) people's inertia, resistance

[Key continued on following page]

15. (M) development and improvement of substances affecting genes that act reliably with no side effects
(E) injection device to deliver substances affecting genes into body
(Sys) establishing control and observation system or training, joint research between geneticists, molecular biologists, physiologists, pathologists, and clinical physicians.
There are many patients with hereditary oxygen deficiency who can be treated by such an approach
16. Social Recovery, Welfare
17. Setting up system of providing periodic health service for aged people with limited means
18. (+) organizational role of administration
19. (-) costs, investment, scale
20. (M) analytical reagents
(E) multichannel automated biological analyzer, minicomputer, X-ray facility, ultrasonic wave generator, power supply, stretcher with high machine operation capability, brain wave scanner, electrocardiograph, other MD equipment
(Sys) various physiological, pathological, and biochemical algorithms
21. Setting up system of providing periodic bath service for aged people with limited means
22. (+) organizational role of administration
23. (-) costs, investment, scale
24. (E) microbus with water heater and bath, ultrasonic whole body bathing facility, highly mechanized stretcher.
A few self-governing bodies will start the service with the hope that it will sweep the entire country
25. Wide use of mobile diagnostic vehicle which conducts health checks in short order by periodic trips to factories to cater to handicapped workers and the aged
26. (+) organizational role of administration
27. (-) costs, investment, scale
28. (M) analytical reagents
(E) brain wave scanner, electrocardiograph, other ME equipment
(E) multichannel automated biochemical analytical facility, minicomputer, X-ray facility, ultrasonic wave generator, power supply, bus (wheelchairs can enter and depart)
(Sys) various physiological, pathological, and biochemical algorithms
29. Multifunctional beds are developed to provide bath service, device to prevent falling out of bed, and lavatory facilities for people with very serious disease and highly handicapped which the country or local self-governing body makes available
30. (+) organizational role of administration
31. (-) costs, investment, scale
32. (M) high specific strength material
(C) hydraulic and pneumatic equipment
(E) multifunctional bed which can be inclined, rotated, or moved, air film device, attachments for bathing and toilet use
(Sys) geriatricians, clinical physicians, psychologists, and mechanical technologists in joint research
Development of multifunctional bed has been quite fruitful. It is important that the people who need them get to use them

[Key continued on following page]

33. The health of a handicapped or aged is checked and suitable occupation, capability, and training program are established through the necessary personnel, mechanical system, facilities, and equipment that will be developed and widely used
34. (+) organizational role of administration
35. (-) costs, investment, scale
36. (E) mental capability tester, nerve reflex tester, various muscle testers, metabolic functions during exercise tester, minicomputer
    (Sys) joint research between psychologists, educator, counsellor, case worker, labor physiologists; comprehensive judgment program, training program, and software construction
37. Braille printing will be performed with minimum effort and economically through a system that will become practical and make available information to the blind very close to what is available to a normal person
38. (+) organizational role of administration
39. (-) costs, investment, scale
40. (E) microcomputer, braille printing, OCR equipment
    (Sys) braille conversion program, printing software
41. The health of an aged will be accurately assessed, the aged's wishes will be consulted, the optimum occupation and work capability will be assessed, and training programs will be established to provide the aged the joy of participating in productive activity through the necessary personnel and mechanical system that will be developed and activated
42. (+) organizational role of administration
43. (-) costs, investment, scale
44. (E) mental capability tester, nerve reflex tester, various muscle strength testers, metabolic functions during exercise tester, minicomputer
    (Sys) joint research between psychologist, educator, counsellor, case worker, and labor physiologist, comprehensive diagnosis program, training program, construction of software
45. High capability wheelchairs with power, sensing capability, and robot functions will be supplied or loaned to greatly expand a crippled person's way of life
46. (+) organizational role of administration
47. (-) costs, investment, scale
48. (M) high specific strength material, high specific output battery
    (C) hydraulic and pneumatic machine
    (E) easily operated robot, light weight and high output motor, alarm device, voice device
49. Publicly organized or private business conducted industrialization of sports and health education guidance becomes commonplace to maintain and promote health as well as protection from diseases starting from the young
50. (+) people's awareness, consensus
51. (-) costs, investment, scale
52. (C) various sensors and transmitters for body devices
    (E) body training physiological tester, computer, communication gear
    (Sys) physiological function diagnosis software, software for setting up suitable sports program, data bank for physical training and sports.
    Efforts to stay free from illness are the best approach both individually and nationally to cut down on the high cost of medical services



Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Development of mental and physical capability training and retraining personnel, mechanical system, facilities and equipment to provide proper occupation suited to physically handicapped and the wide use of such a system
9. (+) organizational role of administration
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
90.6	0.73	(9) ⊕[illegible] ⊖[illegible] (10)	[illegible] (11)
94.2	0.72	(13) ⊕[illegible] ⊖[illegible] (14)	[illegible] (15)
90.2	0.68	(17) ⊕[illegible] ⊖[illegible] (18)	[illegible] (19)
88.7	0.69	(21) ⊕[illegible] ⊖[illegible] (22)	[illegible] (23)
96.1	0.69	(25) ⊕[illegible] ⊖[illegible] (26)	[illegible] (27)
100.0	0.70	(29) ⊕[illegible] ⊖[illegible] (30)	[illegible] (31)
80.9	0.66	(33) ⊕[illegible] ⊖[illegible] (34)	[illegible] (35)
100.0	0.69	(37) ⊕[illegible] ⊖[illegible] (38)	[illegible] (39)
94.1	0.68	(41) ⊕[illegible] ⊖[illegible] (42)	[illegible] (43)
35.4	0.61	(45) ⊕[illegible] ⊖[illegible] (46)	[illegible] (47)
100.0	0.67	(49) ⊕[illegible] ⊖[illegible] (50)	[illegible] (51)
46.8	0.39	(53) ⊕[illegible] ⊖[illegible] (54)	[illegible] (55)

11. (E) development and improvement of mental and physical functions training equipment and facility
    (B) occupational training facility for the aged
    (Sys) joint research by psychologists, educator, counsellor, case worker, and labor physiology-occupational training specialist
12. Development of people, machines, system, facilities, and equipment to match the proper occupation to physically handicapped and aged and the wide use of such a system
13. (+) organizational role of administration
14. (-) costs, investment, scale
15. (E) development and improvement of various mental and physical functions training equipment and facility
    (B) occupational training facility for physically handicapped and aged
    (Sys) joint research by psychologists, educator, counsellor, case worker, labor physiologists, and occupational training specialist

[Key continued on following page]

16. Development and materialization of technological system that enables the ready provision or change in scale of facilities and equipment on home workshops and in plants to adjust to the mental and physical situation of physically handicapped and aged
17. (+) organizational role of administration
18. (-) costs, investment, scale
19. (M) development and improvement of suitable building materials of low hazard to physically handicapped and aged
(C) development and improvement of parts, machines, and facilities for physically handicapped and aged which are suitable and low hazard
(B) standardization and specification of industrial building material, standardization and specification of industrial construction, equipment, and facilities for physically handicapped and aged
(Sys) joint research by builder, labor physiologist, physician, psychologist, case worker
20. Public convalescent homes designed to ease the pains of severely handicapped by serious injury, the infirm due to adult diseases and patients with intractable diseases become commonplace
21. (+) people's awareness, consensus
22. (-) costs, investment, scale
23. (C) development of parts, equipment and facility of low hazard suitable to physically handicapped and aged
(E) pressure sensing switch system placed on walls and places where physically handicapped and aged can reach
(B) development of residential construction designed to lighten the load of physically handicapped and recuperating people.
A few local governments have started on such a course. These should be improved and made more available
24. High level machines, equipment, and attachments are developed to enable handicapped and aged to work side by side with normal healthy people, and these are lent to industry by the nation or local governments
25. (+) organizational role of administration
26. (-) costs, investment, scale
27. (M) high specific strength construction material
(C) hydraulic machines, pneumatic machines, gas (such as CO_2) operated machines, muscle current detection sensor
(E) high level functioning wheelchair, muscle current control gas pressure accuated artificial limb, system to enable handicapped and aged to readily readjust ordinary machinery
28. Development of high level auxiliary equipment which can substitute to a certain degree for the sensory functions such as sight, hearing, and touch and intent display organ such as voice of the physically handicapped which equipment can be borrowed from the country or local government
29. (+) research and development establishment efforts
30. (-) costs, investment, scale
31. (C) development of various sensors and sensor arrays
(E) development of microcircuits to capture and amplify muscle current and nerve current at specific sites, development of microdevices to specific nerve or muscle current for conversion to voice or mechanical energy, development and miniaturization of voice or light signals into special stimuli to the brain or nervous system

[Key continued on following page]

32. Outdoor sports facilities are set up over the entire nation for household groups, local groups, and industrial groups of long standing nature where their living is not excessively inconvenienced and their work requires considerable labor
33. (+) people's awareness, consensus
34. (-) costs, investment, scale
35. (E) development, improvement of various training equipment and facilities
(B) long term resident training facility
(Sys) development of facility for system to judge the economic status of training and sports and make disbursements accordingly. This may become an important direction to future excess leisure activities
36. High level artificial limbs are developed by which commands from the brain are outputted through VLSI, electrical, pneumatic, or hydraulic force with power close to that of the normal muscle, and this capability is provided by the country or local government
37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (M) high specific strength construction material, compressed gas (such as CO_2)
(C) hydraulic equipment, pneumatic equipment, muscle current detection sensor
(E) muscle current controlled gas operated motor artificial limb, VLSI, electric/pneumatic (air pressure mode) servo mechanism
(Sys) joint research by labor physiologist, pathologist and mechanical technologist
40. High level auxiliary equipment is developed to enable physically handicapped to use machinery with almost the same level as that of a healthy man, and this equipment is made available at no cost by the country or local government
41. (+) organizational role of administration
42. (-) costs, investment, scale
43. (M) high specific strength construction material, compressed gas
(C) hydraulic equipment, pneumatic equipment, pneumatically operated equipment, muscle current detection sensor
(E) high performance wheelchair, muscle current controlled pneumatically operated artificial limbs
44. An individual numbering system is established which will be aimed at effectively raising the level of health training service while not intruding on the privacy of the individual
45. (+) organizational role of administration
46. (-) people's inertia, resistance
47. (C) magnetic card
(Sys) multiple check system to prevent invasion of privacy, establishment of legal system to prevent invasion of privacy
The effect will be large, sports facilities for recreation parks in cities can be operated cheaply and in unison
48. Auxiliary equipment designed to ease the physical efforts of severely handicapped people and people with withered muscles, and this equipment is lent out by the country or local government
49. (+) research and development establishment efforts
50. (-) costs, investment, scale

[Key continued on following page]

51. (M) artificial nerves
(C) various muscle current detection sensors, various specific nerve current detection sensors
(E) VLSI that amplifies muscle and nerve currents from certain sites and recognises the pattern, VLSI that converts muscle and nerve current into voice and mechanical energy
(Sys) joint research of nerve physiologist, sensory physiologist, machine technologist, and electric industry member
52. Telephone box style health diagnostic facility where a person can obtain unmanned and mechanized health diagnostic service either free or at low cost are located on street corners and public facilities for the use of the general public is expected to become popular
53. (+) organisational role of administration
54. (-) costs, investment, scale
55. (C) disposable instruments
(E) automated health diagnostic terminal (blood pressure, body temperature, pulse, simple biochemical test, blood analysis facility tied together), intelligent terminal, voice synthesis system, computer
(Sys) automated diagnostic system (algorithms, data banks)

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REPLY TO THE WORLD'S NEEDS AND REACT TO INTERNATIONAL SOCIETY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 108-125

[Article by Kingo Harazawa]

[Text] International Exchange and Trade

In the Midst of Increasing External Pressure

Japan does not possess varied natural resources. It exists far removed from the world's principal economic markets in an economic geographic sense, and it has to depend nearly completely on imports to maintain its present industry and for the resource materials its 100 million people need to subsist. To this end it must export finished goods to acquire necessary foreign exchange.

Since the end of World War II, Japan has been able to rise out of the hard blows of defeat and destruction through its abundant supply of high class labor and the dedication of its business and management people. Resource products, production technology, knowhow, and capital available in abundance were capitalized on, and this favorable situation was exploited to enable Japan to provide the world markets with consumer goods, durable consumer goods, and various industrial materials as it made the transition from a limited supplier to a basic supplier and established itself a position in international trade. Japan became the basic supplier to the world market in low cost, good quality heavy and chemical industry products.

Then came the so-called oil shock of October 1973 at which time the various inconsistencies which had accumulated in the 30 years following World War II became exposed. Oil, various basic goods, food, and agricultural products which had been items of the buyer's market made the turnover to items of the seller's market, and it became established that this was to be a permanent situation. The rise in cost of raw materials, energy, and food naturally had a very great effect on the industry and economy of Japan which is the most import-dependent country in the world, and this impact is expected to become felt even more strongly in the future.

On another front, the capital which Japan has built for itself through this period of high growth covers a wide area and totals to a vast sum, and this was accumulated over the base attained through the most modern production technology since the war. As a result, it possesses industrial production facilities that are much newer than those of the other leading countries, and its competitive strength excepting certain specialties such as aluminum metals is extremely strong despite its shortcomings of raw materials, energy, environmental problems, and siting. Because they had overwhelmed markets such as the West European market whose facilities overall had suffered from age, the feeling of a threat from the good quality, low cost goods from Japan and obstruction behavior became enhanced.

When we try to predict what will happen from here on to the end of the present century and into the first part of the next century, the various factors which control the international environment operate in the midst of North-South interrelationships, relationships between leading countries and within the West, and the East-West relationships. There are, on one hand, a trend to form trade blocks and movements toward regional organizations while, on the other hand, developments in international division of labor and development movements. There are times when the former is more active and times when the latter seems to play the greater role. It is in the midst of such a situation that Japan has to follow the path of a manufactures trade country just as before.

Transport Technology That Is Increasing in Importance

For Japan to be able to overcome its basic limitations, retain its characteristics, and develop its status in the midst of this present transitional international economic situation, it will have to cope with basic problems such as a development system to aid developing countries, an exchange system for smooth interflow of man, material, and information between continents, a stable long term assured system for raw materials and energy resources, and a system to maintain active trade with the products of its industries in the international market.

Aid to developing countries for take-off is a basic problem of the North-South problem, and the core of activities for take-off is industrialization. Aid for industrialization and the necessary establishment of education and technology naturally can assume various forms such as compensatory, tied, untied, individual, or organizational. In addition, it is important that the developing country is able to improve its rate of self-sufficiency in food, stabilize its population, retain a good environment, and prevent pollution. Unless these foundations are established, efforts in industrialization will fail and large public loss be the result.

Japan's spectacular economic and industrial development in the postwar period was mainly the result of technological innovations in transportation and traffic. The special ships such as tankers and dry cargo ships which were made very large greatly lowered costs for transporting oil and raw materials and export of finished products. As a result of such development, Japan was able to exploit a superior position in its trade position despite its geographically disadvantageous situation.

Higher level export products, faster transport of goods, and simplification of the load in the absence of the establishment of an infrastructure will be necessary in the future. At the same time, stability, environment protection, and greater efficiency are vital to import and transport of resources and goods. The main stream of intercontinental travel from here on may be by subsonic and transsonic travel on large planes, and every effort must be taken to enlarge the scale, increase the safety aspects, and reduce the manpower required. Information-communication is expected to expand its role faster than transport-traffic from here on.

Japan's international aid, exchange, and trade are beginning to assume greater variety, increase in number, and involve more direct investments and siting in other lands, and the portion of firms going multinational will increase. This is being accompanied by the assignment of many necessary personnel in foreign countries as a result of which not only is there need to maintain business communications in active and efficient manner but to establish various types of information service including the education and entertainment of those relocated and their children. A system to maintain such multifaceted information service and communication channels and service must be established and continually upgraded.

Establishment of Overseas Information Network

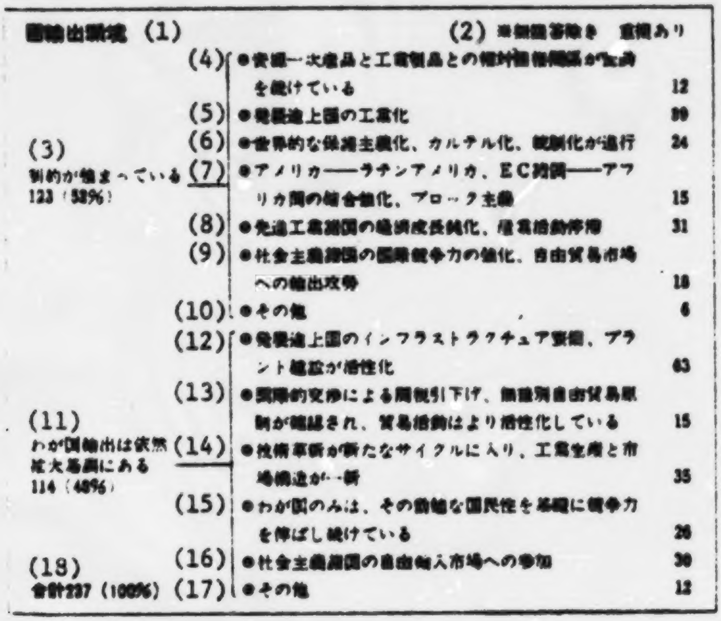
Japan must look to overseas sources for practically all of its raw materials and energy resources. Now, in these areas, powerful exporting-country organizations are appearing and the resources producing countries are beginning to institute production controls and price fixing. In order to cope with such trends, Japan will have to practice energy conservation, develop technology to conserve resources, use substitute resources, convert to substitute energy, and develop overseas resources to which this country can have free access. At the same time, efforts in developing capability to use low grade coal, agricultural wastes, oil shale, and tar sand which are vast resources not used to date will be increased. The establishment of a system for developing and importing from countries with such vast reserves at a profit to those countries through economic and technological aid and cooperation may become highly necessary.

No matter how smoothly we try to make our country's industry fit into the international society, in the final analysis, it becomes absolutely necessary that Japan's industry respond to changes in situation, accurately assess the needs of international society, and strive for a position of adequate activity and competitive strength in international industry when seen from the standpoint of Japan's predestined limitations.

This country hereafter will accurately predict and grasp the needs of the world in all areas and strengthen its ties in all directions. It must accurately grasp and analyze information relative to governments, economics, science, technology, and society in rapid manner, develop a strength to organize needs with a sharply industrialized system, and establish good engineering and after-sale service. The role of technology development that can stand up in the midst of fresh viewpoints such as information processing and communication in the midst of these efforts is very large.

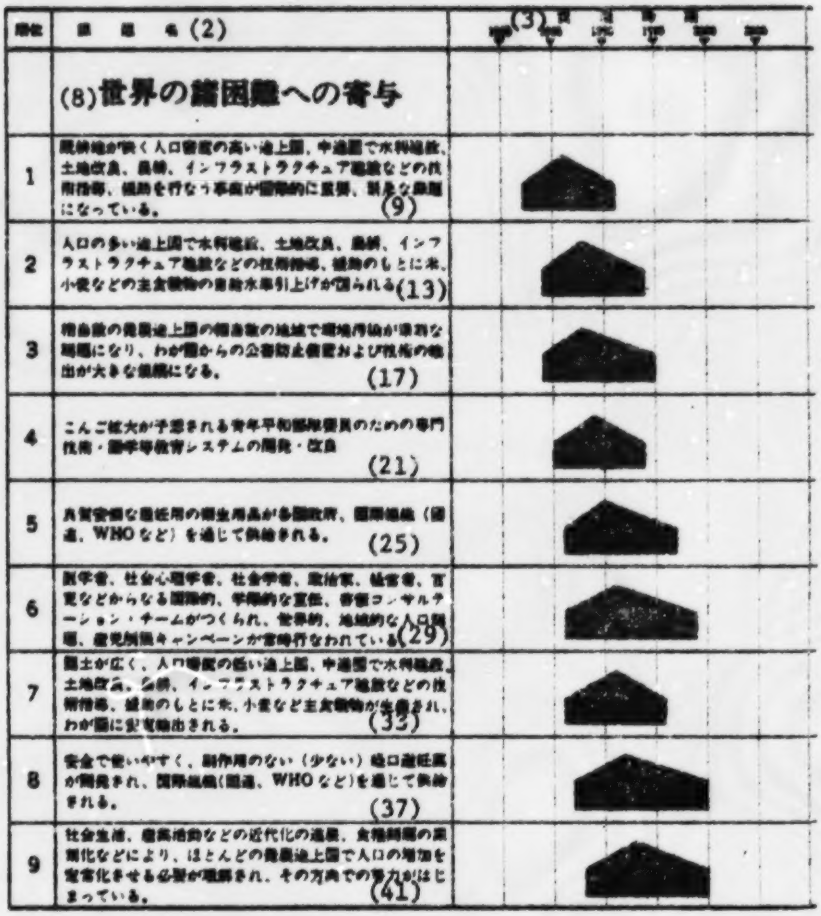
Furthermore, as this country's overseas sitings, industrial development, and joint ventures abroad become more developed, the protection and improvement of the regional environment peripheral to the industry and the working environment within the industry become necessary, and technology development that does not conflict with the desires of the local society will be important.

The fundamental problem for Japan is that the world must be made to accept, via such activities on all fronts such as technology, economics, and culture, that Japanese industry is an indispensable factor for world development.


(1)
(2)
(3)
123 (52%)
(4) 12
(5) 39
(6) 24
(7) 15
(8) 31
(9) 18
(10) 6
(11)
114 (48%)
(12) 63
(13) 15
(14) 35
(15) 26
(16) 30
(17) 12
(18)
237 (100%)

Key:

1. Export environment
2. *Excluding nonrespondents, some duplications
3. Restrictions are increasing
4. The relative price relationships between resources and primary products vice industrial products are continuing to change
5. Industrialization of developing countries
6. Change to protectionism, cartel formation, and imposition of controls is taking place in worldwide manner
7. Strengthening of ties and block-ism in the Americas, Latin America, EC countries, and African countries
8. Blunted economic growth and industrial stagnation in the leading industrial countries
9. Reinforced international competitive strength of socialistic countries and export attack on the free trade market by them
10. Other factors
11. Japan's export is in an expansion stage as before
12. Infrastructure establishment and plant construction are active in developing countries
13. Lowered duties as the result of international negotiations and the principle of nondiscriminatory free trade are being recognized as a result of which trade activity is improving
14. Technological innovation is entering a new cycle accompanied by improvement in industrial production and market structure
15. Japan alone is growing in competitive strength on the basis of its people's industriousness
16. Participation in free import markets by socialistic countries
17. Other
18. Total 237 (100%)



(1)	(2)	(3)
	(8)世界の諸困難への寄与	
1	[illegible] (9)	
2	[illegible] (13)	
3	[illegible] (17)	
4	[illegible] (21)	
5	[illegible] WHO [illegible] (25)	
6	[illegible] (29)	
7	[illegible] (33)	
8	[illegible] WHO [illegible] (37)	
9	[illegible] (41)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Contribution to the Distressed Countries of the World
9. Enterprise to provide technological guidance and aid to developing and partially developed countries of small arable area and high population density along the line of water utilization construction, land improvement, agriculture, and establishment of infrastructure becomes an important and urgent international problem
10. (+) political organizational role
11. (-) costs, investment, scale
12. (Ser) road and harbor consultation, consultations on building, warehouses, and elevators, construction
    Industrialization is not possible without some degree of food self-sufficiency. Food related technology aid is the most urgent international problem

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
86.7	0.72	(10) [illegible] (11)	[illegible] (12)
100.0	0.76	(14) [illegible] (15)	[illegible] (16)
81.1	0.73	(18) [illegible] (19)	[illegible] (20)
85.5	0.72	(22) [illegible] (23)	[illegible] (24)
89.7	0.72	(26) [illegible] (27)	[illegible] (28)
94.3	0.72	(30) [illegible] (31)	[illegible] (32)
89.6	0.72	(34) [illegible] (35)	[illegible] (36)
83.8	0.72	(38) [illegible] (39)	[illegible] (40)
100.0	0.73	(42) [illegible] (43)	[illegible] (44)

13. Raise the level of self-sufficiency in major cereal products such as rice and wheat of developing countries with large population through guidance and aid in water utilization construction, land improvement, agriculture, and infrastructure development
14. (+) political organizational role
15. (-) costs, investment, scale
16. (M) chemical fertilizers
    (C) concrete pipe, fume pipe, plastic pipe
    (E) large construction machinery, excavating machine, belt conveyer, various large agricultural machinery
    (Ser) land survey, agricultural construction consultation, construction and agricultural water utilization consultation, construction and agricultural business consultation
17. Environmental pollution increases in severity in a number of areas of a number of developing countries, and the scale of export of pollution prevention equipment and technology becomes considerable
18. (+) industry and firm efforts
19. (-) costs, investment, scale

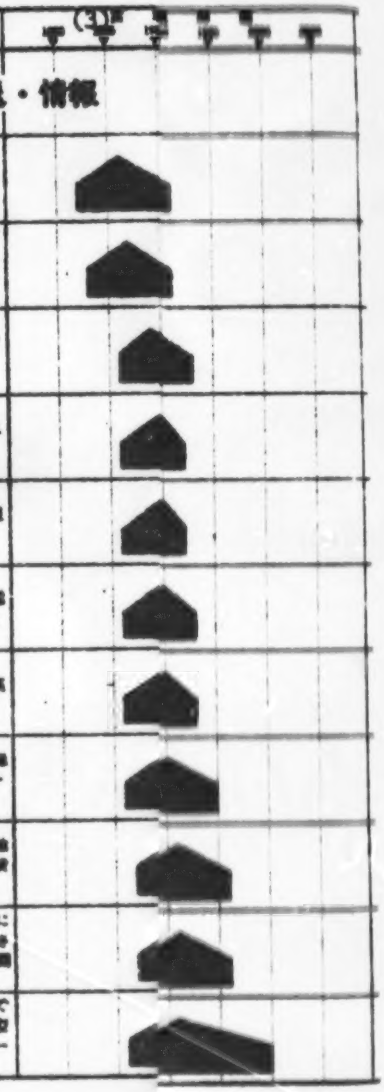
[Key continued on following page]

20. (M) catalyst, adsorbant, absorbant, neutralizing agent, reverse osmosis membrane, ion exchange resin, heat and corrosion resistant material
(E) various pollution prevention equipment, facilities, unit machinery for pollution prevention facility
(Ser) personnel training, technology guidance
Cities of excessive population density similar to Osaka and Tokyo are continuously being formed in developing countries
21. Development and improvement of special technology and language education system for youth peace corps personnel whose need is expected to increase
22. (+) organizational role of administration
23. (-) costs, investment, scale
24. (E) LL system using VTR, high level audiovisual gear, intelligent terminal for programmed learning
(Sys) training program developing system for special language and occupational contents
25. Good quality and low cost contraceptive health products are supplied by each country's government and international organizations (such as the UN, WHO)
26. (+) organizational role of administration
27. (-) people's inertia, resistance
28. (M) oral contraceptive
(C) rubber health products, contraceptive devices
29. Publicity and information consultation teams along international and scientific lines composed of physicians, social psychologists, social scientists, politicians, economists, and government officials are formed to conduct worldwide and local population problem and birth control campaigns
30. (+) political organizational role
31. (-) people's inertia, resistance
32. (M) oral contraceptive
(C) rubber health products, contraceptive devices
(E) contraceptive surgical equipment, contraceptive campaign automobile
(Sys) (particularly in Southeast Asia) establishment and provision of legal and social systems, awareness, realization, and reception of need for social culture
33. Staple cereals such as rice and wheat are produced in developing and partially developed countries of large arable area and small population through technological guidance and aid along the lines of water utilization construction, land improvement, agriculture, and infrastructure establishment, and these cereals are steadily exported to Japan
34. (+) magnitude of foreign and domestic market demand
35. (-) costs, investment, scale
36. (C) concrete pipe, fume pipe
(E) large agricultural construction machinery, various large agricultural machinery
(Ser) agricultural construction machinery, agricultural water utilization construction, agricultural economics consultation, road and harbor construction
The establishment of medium and small grain centers other than the United States, Canada, and Australia is a major problem
37. Oral contraceptive that is safe, easy to use, and with no (very little) side effects is developed and supplied through international organizations (such as UN, WHO)

[Key continued on following page]

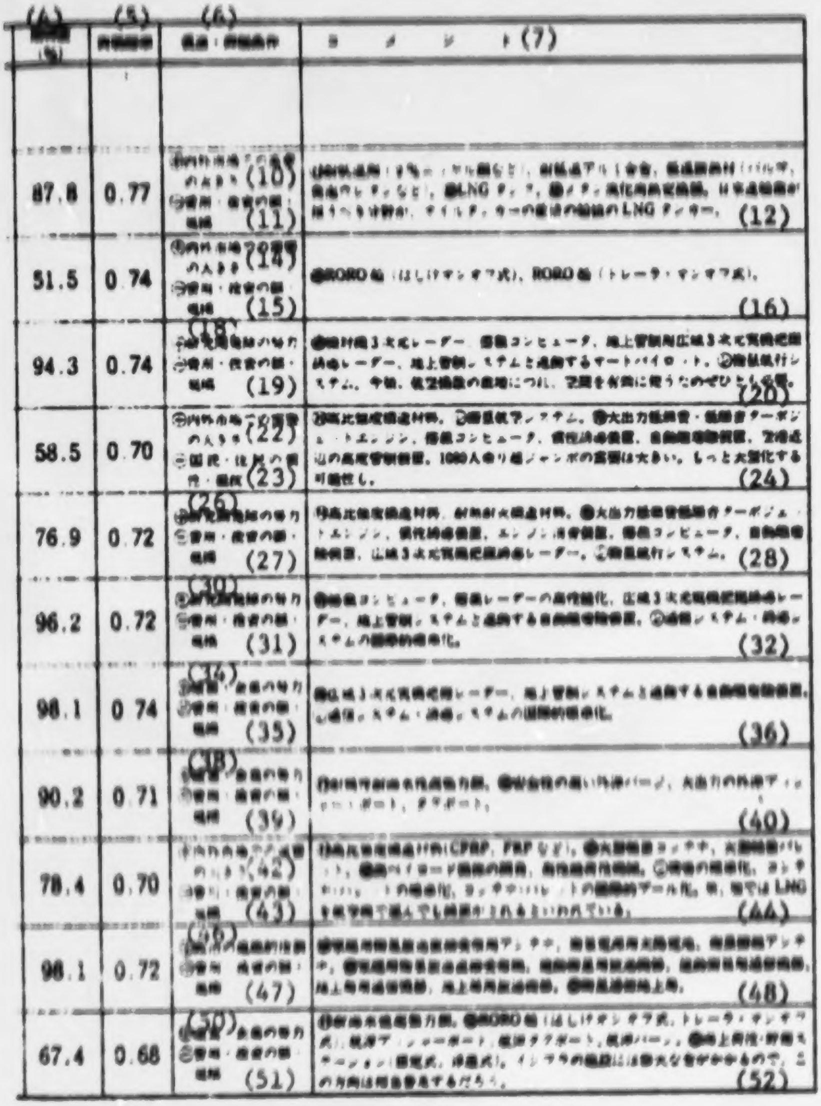
38. (+) organizational role of administration
39. (-) people's inertia, resistance
40. (M) oral contraceptive for women, oral contraceptive for men
    Oral contraceptives are not accepted in Japan, but the oral contraceptives produced in Japan (starting materials) are widely accepted throughout the world
41. The need to stabilize the increase in population of almost all developing countries because of the modernization developments in social and industrial activities and the increasing seriousness of the food problem become understood, and efforts along this direction begin
42. (+) political organizational role
43. (+) people's awareness, consensus
44. (M) oral contraceptive
    (C) rubber health products, contraceptive devices
    (E) contraceptive surgical equipment, automobile for contraceptive campaign
    (Sys) (particularly in Southeast Asia), social and cultural awareness, realization, and reception of establishment, provision, and need for legal and social systems

(1) 番号	課題名 (2)
	(8)大陸間の円滑な交通・輸送・情報
1	LNGが重要な貿易商品となり、多数のLNGタンカーが就航している。 (9)
2	発展途上国では港湾施設などのインフラストラクチュアがまだ十分に整備されておらず、RORO船などのこうした情況に対応する輸送機関がまだ相当の役割を果たしている。 (13)
3	航空機の空中衝突防止自動化システムが世界的に普及する。 (17)
4	1000人乗りの超ジャンボジェット旅客機とその運航システムの実現。 (21)
5	低騒音SST（超音速旅客機）とその運航システムの実現（マッハ2.5以下）。 (25)
6	通信、航海システム、陸上システムの技術の国際化が進み国際定期輸送船の運航はほとんどすべて自動化される。 (29)
7	航空機の自動着陸システムが主要航空機と主要空港で実現している。 (33)
8	輸送速度がそれほど速い必要がない原燃料等貨物の輸送には、経済性の高い各方式のオーシャン・プッシャー・バージ（外洋はしけ）が実用化されている。 (37)
9	機械、化学製品、食品、衣料品、雑貨などの大量高速輸送機として大型航空機がドライカーゴ・キャリヤー（貨物船）におとらずさかんに使われている。 (41)
10	国土が広く、辺地が多い発展途上国で、国内人工衛星による通信、放送、教育番組のシステムが広範に実用化されている（インドネシア、アルジェリアなどはすでに開始している）。 (45)
11	インフラストラクチュアがまだ十分ととのわない地域での海外立地のために、各種方式のRORO船や、多数小型バージを大枠で囲んで押していく航洋プッシャー・バージ方式、海上荷役、貯蔵基地などが普及する。(49)



Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Smooth Traffic, Transport, and Information Between Continents
9. LNG becomes important trade product, and many LNG tankers ply the seas
10. (+) size of demand in foreign and domestic markets
11. (-) costs, investment, scale



(4) (%)	(5)	(6)	(7)
87.8	0.77	(10) (11)	(12)
51.5	0.74	(14) (15)	(16)
94.3	0.74	(18) (19)	(20)
58.5	0.70	(22) (23)	(24)
76.9	0.72	(26) (27)	(28)
96.2	0.72	(30) (31)	(32)
98.1	0.74	(34) (35)	(36)
90.2	0.71	(38) (39)	(40)
78.4	0.70	(42) (43)	(44)
98.1	0.72	(46) (47)	(48)
67.4	0.68	(50) (51)	(52)

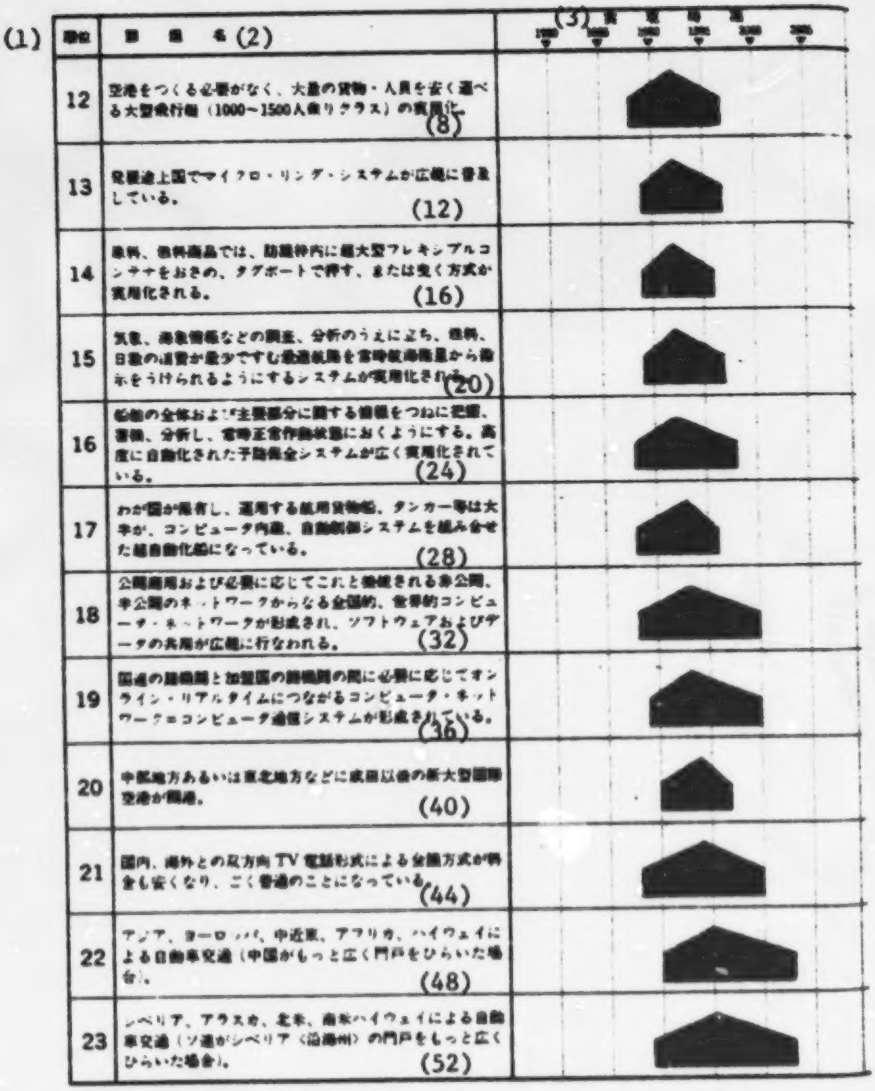
12. (M) low temperature resistant steel (such as 9 percent nickel steel), low temperature resistant aluminum alloy, low temperature insulating material (balsa, foamed urethane, etc.)
    (C) LNG tank
    (E) methane liquefaction heat exchanger
    The Japanese shipping industry hopes to specialize in the construction of LNG tankers which have several times the value of oil tankers
13. Developing countries still lack sufficient infrastructures such as harbor and port facilities, and RORO ships and such to cope with this situation still play a considerable role
14. (+) size of foreign and domestic market demand
15. (-) costs, investment, scale
16. (E) RORO ship (barge on-off type), RORO ship (trailer on-off type)

[Key continued on following page]

17. Automatic system to prevent midair collisions of aircraft becomes used all over the world
18. (+) research and development establishment efforts
19. (-) costs, investment, scale
20. (E) plane to plane 3-dimensional radar, on-board computer, wide area 3-dimensional plane steering radar, ground control system and operating auto pilot
    (Sys) satellite navigation system
    This will be absolutely necessary from here on when the skies will be filled with planes
21. Practical use of 1,000 passenger jumbo jet plane and its flight system
22. (+) size of foreign and domestic market demand
23. (-) people's inertia, resistance
24. (M) high specific strength construction material
    (Sys) satellite navigation system
    (E) large output, low fuel consumption, low noise turbojet engine; on-board computer, inertia guidance equipment, automatic landing facility, high level control facility around airports
    Large need for 1,000 passenger jumbo jet. Look to even larger planes
25. Low noise SST (supersonic passenger plane) and its flight system materialize (Mach 2.5 or less)
26. (+) research and development establishment efforts
27. (-) costs, investment, scale
28. (M) high specific strength construction material, heat and fire resistant construction material
    (E) large output low fuel consumption low noise turbojet engine, inertial guidance facility, engine noise remover, on-board computer, automatic takeoff and landing facility, wide area 3-dimensional plane guiding radar
    (Sys) satellite navigation system
29. Communication, guidance system, planeboard system technology developments take place in international manner, and practically all landings of international route planes are by automation
30. (+) research and development establishment efforts
31. (-) costs, investment, scale
32. (E) on-board computer, making on-board radar more high performance, wide area 3-dimensional plane guiding radar, ground control system and the automatic takeoff and landing facility it operates
    (Sys) international standard for communication and guidance systems
33. Automatic landing system for planes become practical in principal airports and planes
34. (+) industry and firm efforts
35. (-) costs, investment, scale
36. (E) wide area 3-dimensional plane locating radar, ground control system and automatic takeoff and landing facility it operates
    (Sys) international standardization of communication and guidance systems
37. Transport of materials such as fuel oil which do not have to be moved about too rapidly will be by way of economical ocean pusher barge (sea going barge)
38. (+) industry and firm efforts
39. (-) costs, investment, scale
40. (M) weather and sea water resistant high tensile strength steel
    (E) high safety sea going barge, large output sea going pusher boat tugboat

[Key continued on following page]

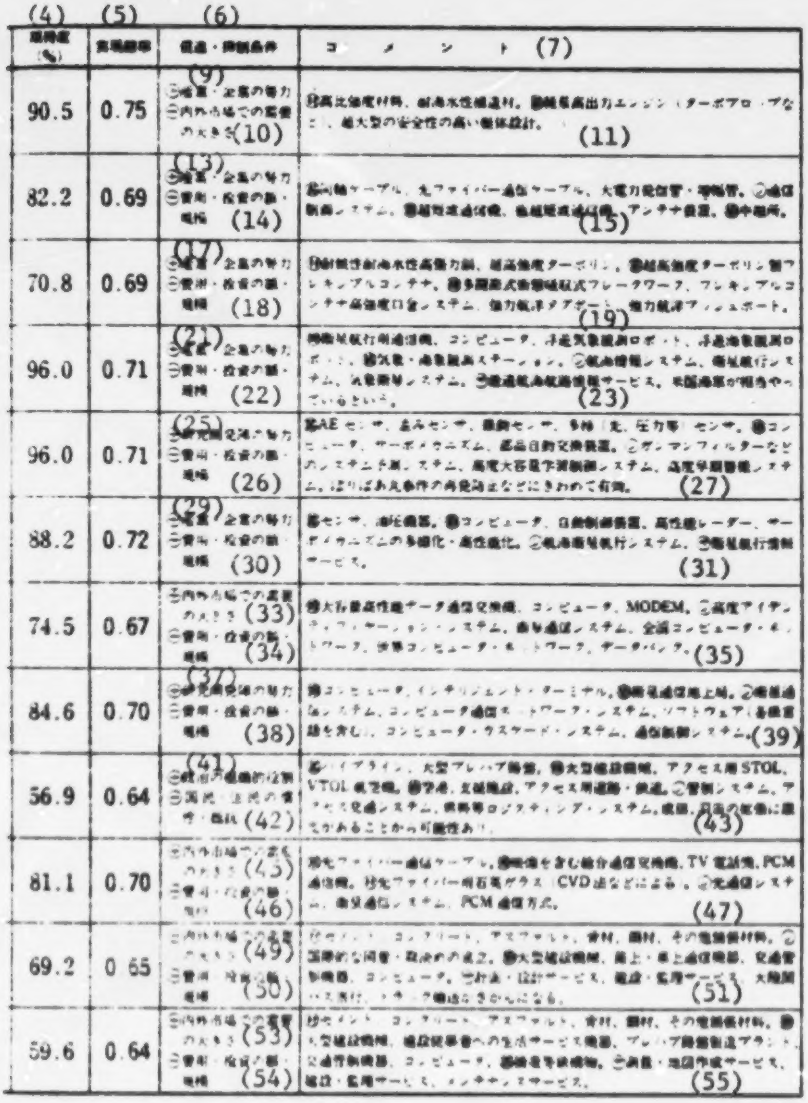
41. Large volume goods requiring fast transport such as machines, chemical products, food, textiles are widely transported by large planes competitive with dry cargo carriers (freighters)
42. (+) size of foreign and domestic market demand
43. (-) costs, investment, scale
44. (M) high specific strength construction material (such as FRP, CFRP)
    (C) large, light container; large, light pallet
    (E) development of plane with high payload, high performance loading machine
    (Sys) standardization of load shape, standardization of container, pallet
    The United States and Canada claim LNG can be carried by plane at a profit
45. Communication, broadcast, and education activities system by domestic satellite becomes practical for a large country with many peripheral areas (such as Indonesia, Algeria)
46. (+) political organizational role
47. (-) costs, investment, scale
48. (C) household antenna for direct reception of satellite broadcast, solar battery to provide satellite power, satellite board antenna
    (E) household receiver for direct reception of satellite broadcasts, broadcast unit for active satellite, communication equipment for active satellite, communication equipment for ground office, broadcast equipment for ground office
    (B) ground office for satellite communication
49. RORO ships and several small barges enclosed in a framework are assembled in a pusher barge mode, seaboard loading, and storage bases become widely used for sites on areas where the infrastructure has not developed sufficiently
50. (+) industry and firm efforts
51. (-) costs, investment, scale
52. (M) sea water resistant high tensile strength steel
    (E) RORO ship (barge on-off type, trailer on-off type), sea going pusher boat, sea going tugboat, sea going barge
    (B) loading and storage station at sea (fixed type, floating type)
    Infratype construction requires vast sums of money, and this mode finds considerable popularity



(1) 順位	課 題 名 (2)
12	空港をつくる必要がなく、大量の貨物・人員を安く運べる大型飛行艇（1000～1500人乗りクラス）の実用化。(8)
13	発展途上国でマイクロ・リング・システムが広範に普及している。(12)
14	原料、燃料商品では、防護枠内に超大型フレキシブルコンテナをおさめ、タグボートで押す、または曳く方式が実用化される。(16)
15	気象、海象情報などの調査、分析のうえにたち、燃料、日数の消費が最少ですむ最適航路を常時航海衛星から指示をうけられるようにするシステムが実用化される。(20)
16	船舶の全体および主要部分に関する情報をつねに把握、蓄積、分析し、常時正常作動状態におくようにする。高度に自動化された予防保全システムが広く実用化されている。(24)
17	わが国が保有し、運用する航用貨物船、タンカー等は大半が、コンピュータ内蔵、自動制御システムを組み合せた超自動化船になっている。(28)
18	公衆通信および必要に応じてこれと接続される非公開、半公開のネットワークからなる全国的、世界的コンピューター・ネットワークが形成され、ソフトウェアおよびデータの共用が広範に行なわれる。(32)
19	国連の諸機関と加盟国の諸機関の間に必要に応じてオンライン・リアルタイムにつながるコンピュータ・ネットワークとコンピュータ通信システムが形成されている。(36)
20	中部地方あるいは東北地方などに成田以後の新大型国際空港が開港。(40)
21	国内、海外との双方向TV電話形式による会議方式が料金も安くなり、ごく普通のことになっている。(44)
22	アジア、ヨーロッパ、中近東、アフリカ、ハイウェイによる自動車交通（中国がもっと広く門戸をひらいた場合）。(48)
23	シベリア、アラスカ、北米、南米ハイウェイによる自動車交通（ソ連がシベリア〈沿海州〉の門戸をもっと広くひらいた場合）。(52)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Practicalization of large seaplane (1,000-1,500 passenger class) to transport large cargo and number of passengers without the need of airport
9. (+) industry and firm efforts
10. (-) size of foreign and domestic market demand



(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
90.5	0.75	(9) [illegible] (10)	[illegible] (11)
82.2	0.69	(13) [illegible] (14)	[illegible] (15)
70.8	0.69	(17) [illegible] (18)	[illegible] (19)
96.0	0.71	(21) [illegible] (22)	[illegible] (23)
96.0	0.71	(25) [illegible] (26)	[illegible] (27)
88.2	0.72	(29) [illegible] (30)	[illegible] (31)
74.5	0.67	[illegible] (33) [illegible] (34)	[illegible] MODEM [illegible] (35)
84.6	0.70	(37) [illegible] (38)	[illegible] (39)
56.9	0.64	(41) [illegible] (42)	[illegible] STOL, VTOL [illegible] (43)
81.1	0.70	[illegible] (45) [illegible] (46)	[illegible] TV [illegible] PCM [illegible] CVD [illegible] PCM [illegible] (47)
69.2	0.65	[illegible] (49) [illegible] (50)	[illegible] (51)
59.6	0.64	[illegible] (53) [illegible] (54)	[illegible] (55)

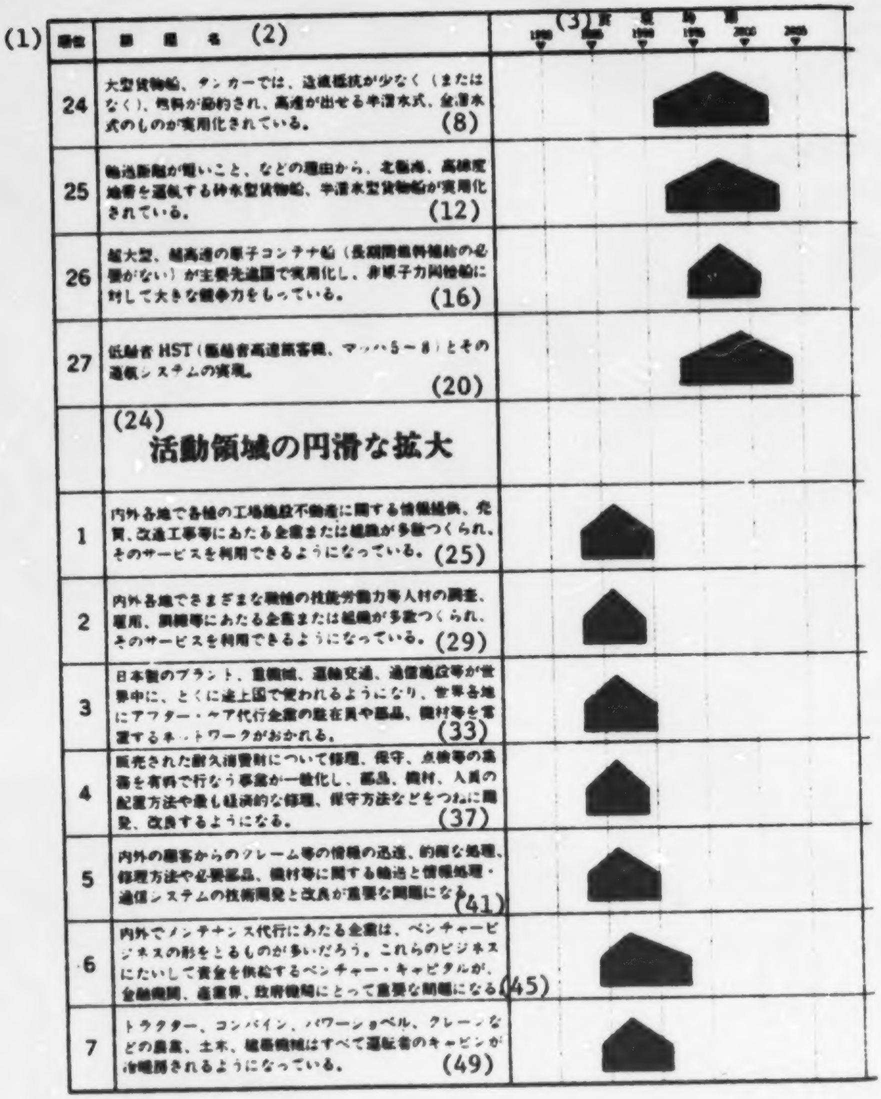
11. (M) high specific strength material, sea water resistant construction material
    (E) light and high output engine (such as turboprop) very large and safe ship design
12. Micro ring system becomes common in developing countries
13. (+) industry and firm efforts
14. (-) costs, investment, scale
15. (C) coaxial cable, optical fiber communication cable, large output transmitting tube-amplifier tube
    (Sys) communication control system
    (E) VHF communication unit, VHF radio, antenna
    (B) relay station

[Key continued on following page]

16. A method of using very large flexible containers within a protective framework drawn or pushed by tugs becomes practical for the transport of raw materials or fuel products
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) weather and sea water resistant high tensile strength material, super high strength tarpaulin
(C) flexible container made of super high strength tarpaulin
(E) multiple joint impact absorbing fleck work flexible container high strength clasp system, powerful sea going tugboat, powerful sea going push boat
20. A system using a weather satellite to survey and analyze weather and sea conditions and which indicates the optimum sea routes while operating on the minimum of fuel and time requirements becomes practical
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (E) communication unit for satellite navigation, computer, floating weather observation robot
(B) weather and sea conditions observation station
(Sys) navigation information system, satellite navigation system, weather satellite system
(Ser) optimum sea route information service
It is said that the United States Navy is practicing this mode on a substantial scale
24. Highly automated protection and safekeeping system becomes widely used to collect, accumulate, and analyze important information relative to shipping overall and strives to maintain normal operation at all times becomes widely used
25. (+) research and development establishment efforts
26. (-) costs, investment, scale
27. (C) AE sensor, strain sensor, vibration sensor, multiple (light, pressure) sensor
(E) computer, servo mechanism, automatic parts exchange facility
(Sys) system prediction system such as gunman filter [phonetic], high level large capacity training control system, high level and rapid warning system
Very effective in preventing a repeat of the Bolivar-maru incident
28. Freighters and tankers owned and operated by Japan are mostly computerized and incorporate automated control systems
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (C) sensor, hydraulic equipment
(E) computer, automatic control facility, high performance radar, servo mechanism that are multiple purpose and high performance
(Sys) satellite sea navigation system
(Ser) satellite sea navigation information service
32. Public commercial use computer network including, if necessary, semipublic or nonpublic networks is formed on national or international basis, and software and data are used in joint manner
33. (+) size of foreign and domestic market demand
34. (-) costs, investment, scale

[Key continued on following page]

35. (E) large capacity high performance data communication exchanger, computer, MODEM
    (Sys) high level identification system, satellite communication system, countrywide computer network, worldwide computer network, data bank
36. Computer network-computer communication system is formed between various organs of UN and various organs of allied countries to provide necessary on-line real time service
37. (+) research and development establishment efforts
38. (-) costs, investment, scale
39. (E) computer, intelligent terminal
    (B) ground office for satellite communication
    (Sys) satellite communication system, computer communication network system, software (including various classes of language), computer cascade system communication control system
40. Development of new airports of the post-Narita type in the Chubu or Tohoku district
41. (+) political organizational role
42. (-) people's inertia, resistance
43. (C) pipeline, large prefab foundation
    (E) large construction machine, access use STOL, VTOL plane
    (B) airport, support facilities, access roads, railroads
    (Sys) control system, access communication system, logisting [phonetic] system for fuel, etc.
    This becomes possible because of limits to expansion of Narita and Haneda
44. Two-directional TV conversation between Japan and other countries will make the cost of conferences very low and become commonplace
45. (+) size of foreign and domestic market demand
46. (-) costs, investment, scale
47. (C) optical fiber communication cable
    (E) comprehensive communication exchanger including pictures, TV dialog unit, PCM communication unit
    (M) quartz glass for optical fiber use (such as CVD method)
    (Sys) communication system, satellite communication system, PCM communication mode
48. Automobile traffic through Asia, Europe, Middle and Far East, and Africa highway system (assuming China opens its doors)
49. (+) size of foreign and domestic market demand
50. (-) costs, investment, scale
51. (M) cement, concrete, asphalt, skeletal material, steel, other reinforcing material
    (Sys) setting up international agreement and handling
    (E) large construction machine, roadside and vehicle communication unit, traffic control unit, computer
    (Ser) plan and design service, construction and management service
    Bus travel between continents as well as truck service become popular
52. Automobile traffic through Siberia, Alaska, North America, and South America highway system (assuming Soviet Union opens its doors)
53. (+) size of foreign and domestic market demand
54. (-) costs, investment, scale
55. (M) cement, concrete, asphalt, skeletal material, steel, other reinforcing material
    (E) large construction machine, living service units for construction workers, prefab foundation production plant, traffic control unit, computer
    (C) steel girders as for bridges
    (Ser) survey and map construction service, construction and management service, maintenance service



(1) 順位	課題名 (2)	(3) 実現時期 1980 1985 1990 1995 2000 2005
24	大型貨物船、タンカーでは、造波抵抗が少なく（またはなく）、燃料が節約され、高速が出せる半潜水式、全潜水式のものが実用化されている。 (8)	
25	輸送距離が短いこと、などの理由から、北極海、高緯度地帯を運航する砕氷型貨物船、半潜水型貨物船が実用化されている。 (12)	
26	超大型、超高速の原子コンテナ船（長期間燃料補給の必要がない）が主要先進国で実用化し、非原子力同種船に対して大きな競争力をもっている。 (16)	
27	低騒音 HST（極超音速旅客機、マッハ5－8）とその運航システムの実現。 (20)	
	(24) **活動領域の円滑な拡大**	
1	内外各地で各種の工場施設不動産に関する情報提供、売買、改造工事等にあたる企業または組織が多数つくられ、そのサービスを利用できるようになっている。 (25)	
2	内外各地でさまざまな職種の技能労働力等人材の調達、雇用、訓練等にあたる企業または組織が多数つくられ、そのサービスを利用できるようになっている。 (29)	
3	日本製のプラント、重機械、運輸交通、通信施設等が世界中に、とくに途上国で使われるようになり、世界各地にアフター・ケア代行企業の駐在員や部品、機材等を常置するネットワークがおかれる。 (33)	
4	販売された耐久消費財について修理、保守、点検等の業務を有料で行なう事業が一般化し、部品、機材、人員の配置方法や最も経済的な修理、保守方法などをつねに開発、改良するようになる。 (37)	
5	内外の顧客からのクレーム等の情報の迅速、的確な処理、修理方法や必要部品、機材等に関する輸送と情報処理・通信システムの技術開発と改良が重要な問題になる (41)	
6	内外でメンテナンス代行にあたる企業は、ベンチャービジネスの形をとるものが多いだろう。これらのビジネスにたいして資金を供給するベンチャー・キャピタルが、金融機関、産業界、技術機関にとって重要な問題になる (45)	
7	トラクター、コンバイン、パワーショベル、クレーンなどの農業、土木、建設機械はすべて運転者のキャビンが冷暖房されるようになっている。 (49)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Large freighters and tankers that induce little wave drag (or none), whose need for fuel is restricted, and that operate at high speed semisubmerged or completely submerged are being used
9. (+) research and development establishment efforts
10. (-) people's inertia, resistance

(4) 期待度 (%)	(5) 実現確率	(6) 促進・抑制条件	コ メ ン ト (7)
83.7	0.67	(9) ⊕研究開発陣の努力 ⊖国民・住民の慣性・抵抗 (10)	Ⓜ耐候性耐海水性高張力鋼材。Ⓢ航海衛星による誘導システム。Ⓔ水ジェット・電磁推進方式など革新的な推進方式の開発改良、合理的な船型の開発・改良、搭載慣性誘導装置、コンピュータ、自動操縦装置、空力的に新たな方向・上下水平舵装置。米国では相当研究が進んでいる。 (11)
57.1	0.61	(13) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (14)	Ⓜ耐熱性（耐冷）高張力鋼。Ⓔ砕氷船型の開発、半潜水砕氷船型の開発、熱による砕氷装置、搭載慣性誘導装置。Ⓢ航海衛星による誘導システム。北極海が世界の中心航路の一つになる可能性もある。 (15)
69.2	0.68	(17) ⊕産業・企業の努力 ⊖国民・住民の慣性・抵抗 (18)	Ⓜ高張力鋼材。Ⓔ船型開発、高経済性舶用原子炉の開発・改良。超高速コンテナ船は、重油だけでは太平洋を無給油横断できない。原子力なら何往復でもできる。 (19)
40.4	0.61	(21) ⊕産業・企業の努力 ⊖国民・住民の慣性・抵抗 (22)	Ⓜ超耐熱燃料、超高比強度耐熱構造材料、タービン用超耐熱耐火材料。Ⓔ大出力ラムジェット・エンジン、革新的な空力構造の機体設計、コンピュータ、自動操縦装置、液体水素燃料タンク。Ⓢ慣性誘導・航行衛星誘導システム。日米（太平洋間）日帰り出張時代の到来。 (23)
64.3	0.69	(26) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (27)	Ⓔコンピュータ。Ⓢ産業用固定資産市場データバンク、データ通信ネットワーク。Ⓢ産業用固定資産仲介サービス（内外にわたる）、内外産業用固定資産情報サービス、内外産業プラント・メンテナンスサービス。 (28)
83.6	0.71	(30) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (31)	Ⓔコンピュータ、各種訓練機器（シミュレータ）。Ⓢ衛星通信システム、データ通信システム、技能者訓練システム、技能人事データバンク・システム。Ⓢ国際的リクルーティング・サービス、国際的技能者職業紹介サービス、国際的人事調査サービス、国際的要員訓練サービス。 (32)
86.4	0.73	(34) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (35)	Ⓔ部品・機械加工用複合加工機械システム、デポから末端需要家にいたる輸送交通手段、コンピュータ。Ⓔ部品機材デポ・ステーション。Ⓢ部品機器の標準化・規格化システム、データ通信システム、部品機材クーリエ・システム。大企業の多角化としても、ベンチャービジネスとしても事業化機会大。 (36)
82.8	0.72	(38) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (39)	Ⓔ部品・機材加工用複合加工機械システム、デポから末端需要家にいたる輸送交通手段、コンピュータ。Ⓔ部品機材デポ・ステーション。Ⓢメンテナンス方法の標準化・規格化システム、部品機器の標準化・規格化システム、データ通信システム、部品機材クーリエ・システム。 (40)
92.9	0.72	(42) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (43)	ⓈSE的研究、VE的研究、OR、人間科学的研究、情報処理システム。こういうサービス分野で技術革新をおこせば事業化機会はひじょうに大きい。 (44)
66.0	0.68	(46) ⊕行政の積極的役割 ⊖費用・投資の額・規模 (47)	Ⓢ必要性の認識、制度の確立と整備、企業情報システム。Ⓢ金融サービス（ベンチャー・キャピタル・ファイナンス・サービス）。 (48)
69.8	0.70	(50) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (51)	Ⓜシリンダコーティング材、断熱材。Ⓔ小型イージーケア自動車、小型イージーケア機関。 (52)

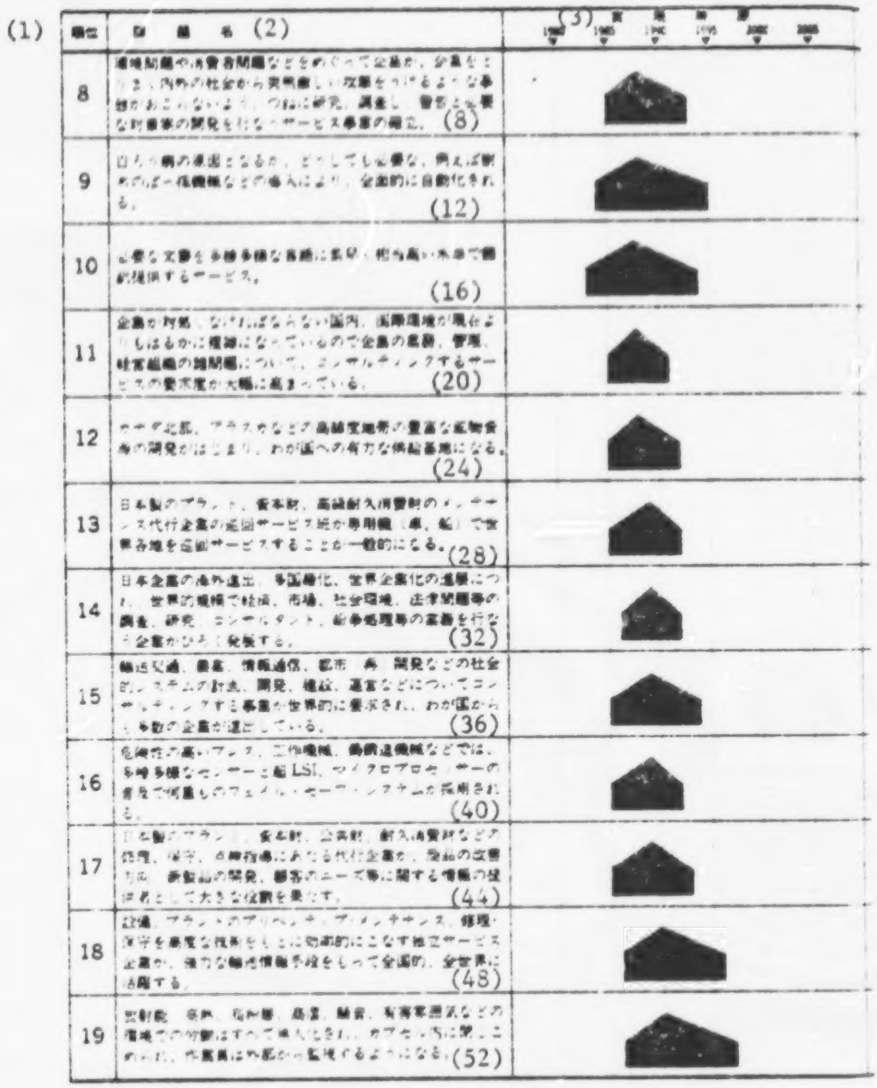
11. (M) weather and sea water resistant high tensile strength steel
(Sys) guidance system by navigation satellite
(E) development of innovative propulsion modes such as hydrojet or magnetic thrust mode, development of rational ship types, on-board inertial guidance facility, computer, automatic pilot facility, aerodynamically new directional, vertical, and horizontal steering device
Research is quite advanced in the United States
12. For reasons such as the shorter transport distance, the Arctic Sea and high latitude zones are traversed by icebreaking freighters and semisubmerged freighters
13. (+) industry and firm efforts
14. (-) costs, investment, scale

[Key continued on following page]

15. (M) weather resistant (cold) high tensile strength steel
(E) development of icebreaking ship, development of semisubmersible icebreaking ship, icebreaker using heat, on-board inertial guidance facility
(Sys) guidance system by navigation satellite
There is possibility that the Arctic Sea will be one of the central seaways
16. Superlarge and superfast nuclear container ships (no need for reloading fuel over long terms) become practical in major leading countries, and they possess great competitive strength against nonnuclear ships of the same class
17. (+) industry and firm efforts
18. (-) people's inertia, resistance
19. (M) high tensile strength steel
(E) ship development, development of nuclear power ship of high economic nature
Super high speed container boat cannot cross the Pacific only with fuel oil without refueling. A nuclear powered ship can make a number of crossings before refueling
20. Low noise HST (hypersonic high altitude passenger plane, Mach 5-8) and its flight system become practical
21. (+) industry and firm efforts
22. (-) people's inertia, resistance
23. (M) high heat content fuel, super high specific strength heat resistant structural material, turbine super heat and fire resistant material
(E) large output column jet engine, innovative aerodynamic structured wing design, computer, automatic pilot facility
(C) liquid hydrogen tank
(Sys) inertial guidance and satellite navigation guidance system
24. Smooth Expansion of Active Regions
25. A number of businesses or organs to offer, buy, and redo factory installed real estate at home and abroad are formed, and their services are utilized
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (E) computer
(Sys) fixed assets market data bank for industry use, data communication network
(Ser) industry use fixed asset agent service (extending over international lines), international and domestic use fixed assets information service, international and domestic industrial plant maintenance service
29. A number of industries or organizations are formed both at home and abroad which survey, hire, and train skilled labor for various occupations, and this service becomes widely used
30. (+) industry and firm efforts
31. (-) costs, investment, scale
32. (E) computer, various training equipment, simulator
(Sys) satellite communication system, data communication system, skilled worker training system, skilled workers data bank system
(Ser) international recruiting service, international skilled worker occupational introduction service, international skilled worker survey service, international manpower training service
33. Japanese produced plants, heavy machinery, transport traffic, and communication facilities are used throughout the world and particularly in developing countries, and a network is set up in an after care industry through proper personnel, parts, and supplies

[Key continued on following page]

34. (+) industry and firm efforts
35. (-) costs, investment, scale
36. (E) parts and composite fabrication machinery system for machine finishing, transport traffic means from depot to terminal consumer, computer
    (B) parts and materials depot station
    (Sys) standardization and specification system for parts and equipment, data communication system, parts and materials courier system
    Large opportunity for industrializing business regardless of whether large business is diversifying or a venture business is concerned
37. An industry which repairs, maintains, and inspects durable consumer goods which are purchased becomes widespread, and the best deployment of parts, materials, and personnel and the most economical repair and maintenance methods are always being developed and modified
38. (+) industry and firm efforts
39. (-) costs, investment, scale
40. (C) parts and composite fabrication machinery system for machine finishing, transport traffic means from depot to terminal consumer, computer
    (B) parts and materials depot station
    (Sys) standardization and specification system of maintenance laws, standardization and specification system for parts and materials, data communication system, parts and materials courier system
41. Methods of processing and settling in rapid and accurate manner information pertinent to claims of customers both domestic and foreign and the technological development of transport and information processing relative to necessary parts and materials become important problems
42. (+) industry and firm efforts
43. (-) costs, investment, scale
44. (Sys) SE research, VE research, OR, human science research, information processing system
    By causing technological innovation in these service areas, there are very many opportunities for industrialization
45. Many businesses both here and abroad are of the venture type where maintenance businesses are concerned. The venture capital to be supplied these businesses becomes an important problem for fiscal organs, industrial world, and government organs
46. (+) organizational role of administration
47. (-) costs, investment, scale
48. (Sys) establishment and provision of needed awareness and system, business information system
    (Ser) fiscal service (venture capital, finance service)
49. The operator's cabin of all agricultural, engineering, and construction machinery such as tractors, combines, power shovels, and cranes all become air conditioned
50. (+) industry and firm efforts
51. (-) costs, investment, scale
52. (M) ceiling cauking, insulating material
    (E) small easy care refrigeration unit, small easy care heating unit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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Establishment of a service to develop policies to constantly research, survey, and inform on matters related to environmental problems and consumer problems which can result in severe attacks on industry
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] %	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
70.9	0.67	(9) [illegible] (10)	[illegible] (11)
87.5	0.71	(13) [illegible] (14)	[illegible] (15)
91.4	0.70	(17) [illegible] (18)	[illegible] (19)
83.6	0.71	(21) [illegible] (22)	[illegible] MIS [illegible] (23)
90.0	0.77	(25) [illegible] (26)	[illegible] (27)
61.4	0.64	(29) [illegible] (30)	[illegible] (31)
80.4	0.70	[illegible] (33) [illegible] (34)	[illegible] (35)
81.0	0.70	(37) [illegible] (38)	[illegible] SE·OR·VE [illegible] (39)
96.4	0.72	(41) [illegible] (42)	[illegible] (43)
70.2	0.67	(45) [illegible] (46)	[illegible] (47)
77.8	0.68	(49) [illegible] (50)	[illegible] (51)
98.5	0.71	(53) [illegible] (54)	[illegible] (55)

11. (Sys) industrial environment data bank, industrial environment evaluation system, industrial environment early alarm system
(Ser) industrial environment consultation service
Industrial environment early warning development becomes work of think tank
12. While it may be a cause of Reynaud's syndrome, absolutely necessary steps such as the harvesting of trees will be conducted completely in automated manner with the introduction of the necessary machinery
13. (+) research and development establishment efforts
14. (-) costs, investment, scale
15. (C) hydraulic equipment, pneumatic equipment, light sensor, hydraulic sensor
(E) system to run over very bumpy and irregular land, microcomputer, remote control type chain saw (height, angle, starting, stopping, etc.), prevention of labor disasters and occupational diseases in developing countries becomes important

[Key continued on following page]

16. A service to translate desired literature into a number of different languages rapidly
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (E) computer, intelligent terminal, word processor
(Sys) computerized dictionary for new and commonly used words, automated translation program, organization of translation consulting group
(Ser) specialist text translation service
20. Consultation service on various problems related to the business, management, and running organization of a business to handle the ever increasing complexity of the business because of national and international environment becomes widely used
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (Sys) business consultation service, overseas business consultation service
(Ser) MIS [management information system], comprehensive business environment information system
24. Development of the rich mineral resources in the high latitude regions of northern Canada and Alaska begins providing Japan with an effective source of supply
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) sea water and weather resistant (low temperature resistant) high tensile strength steel
(C) conveyer belt for use in cold regions
(E) mining equipment for cold regions, icebreaking ship (including semi-submerged type)
(B) belt conveyer for subcold land use
28. A circulating service in the form of maintenance service sections (using ships, vehicles) is provided to service Japanese produced plants, capital goods, and high class durable consumer goods becomes commonplace
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (E) composite fabrication machine system for parts and materials fabrication, transport traffic facility from depot to terminal consumer, computer
(B) parts and materials depot station
(Sys) standardization of parts and equipment, specification system, data communications system, parts and materials courier system
32. A business to survey, research, consult, and mediate disputes on worldwide scale economics, markets, social environment, and legal problems resulting from Japanese industry's entry into other countries, internationalization, and development in worldwide industries becomes widely developed
33. (+) size of foreign and domestic demand
34. (-) costs, investment, scale
35. (E) computer, business airplane
(Sys) external environment information data bank, legal data bank, research on dispute handling system, satellite communication system
(Ser) dispute handling agency service, legal survey advice service, various external environment survey research service
An international troubleshooter business will certainly prosper

[Key continued on following page]

36. Consultation industry which engages in planning, developing, building, and operating social systems such as transport traffic, agriculture, information communication, urban (re)development becomes much needed, and several such services become available in Japan
37. (+) industry and firm efforts
38. (-) costs, investment, scale
39. (Sys) overseas social development system, data bank, overseas social economic and legal system data bank, SE·OR·VE methods for analysis and planning of social system
    (Ser) overseas government and self-governing bodies consultation service
40. Various types of sensors, VLSI, and microprocessors along with many layers of fail-safe systems are used in high risk operations such as press, machine tool, and casting machine operations
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (C) light sensor, pressure sensor, voice sensor, hydraulic equipment, pneumatic equipment
    (E) microcomputer servo mechanism
    It will be forbidden to cause labor accidents in overseas locations just as in domestic locations
44. Agent business which is concerned with repair, maintenance, and inspection of plants, capital goods, public goods, and durable consumer goods of Japanese make plays large role in disseminating information on improvement in product, development of new items, and meeting customers' needs
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (E) composite fabrication machine system for parts and material fabrication, transport traffic facility between depot and terminal consumers, computer
    (Sys) market and goods situation analysis and prediction system, customer reaction survey system, standardization and specification system for parts and equipment
    Data communication system, parts and materials courier system
    (B) parts and materials depot station
48. Independent service industry which employs high level technology to conduct preventive maintenance, repair, and ordinary maintenance of facilities in efficient manner with access to powerful transport and information becomes active nationwide and worldwide
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (E) nondestructive inspection system, composite fabrication machine system for parts and materials fabrication, transport traffic facility between depot and terminal consumer, computer
    (B) parts and materials depot station
    (Ser) after-sale care and maintenance agency service
    (Sys) preventive maintenance, standardization and specification of parts and equipment, various systems for parts and materials courier service
52. All work in radioactive, high temperature, high dust, high humidity, noise, and harmful environment becomes performed in unmanned manner, sealed within a capsule, and observed by workers from the outside
53. (+) industry and firm efforts
54. (-) costs, investment, scale
55. (C) diverse sensors
    (E) computer, multifunctional intelligent robot
    (B) standardization and specification of reliable shielding (capsulation)

(1) [illegible]	[illegible] (2)	(3)
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21	[illegible] (12)	
22	[illegible] (16)	
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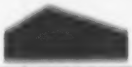
24	[illegible] (24)	
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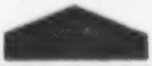
26	[illegible] (32)	
27	[illegible] (36)	
28	[illegible] (40)	
29	[illegible] (44)	
30	[illegible] (48)	
31	[illegible] (52)	

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Fabrication processes and transfer of fabrication products which require speed and complexity beyond man's sensory capabilities will be unmanned to the utmost
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
96.6	0.71	(9) [illegible] (10)	[illegible] (11)
95.9	0.73	(13) [illegible] (14)	[illegible] (15)
85.7	0.71	(17) [illegible] (18)	[illegible] (19)
69.8	0.68	(21) [illegible] (22)	[illegible] (23)
86.3	0.71	(25) [illegible] (26)	[illegible] (27)
84.0	0.68	(29) [illegible] (30)	[illegible] (31)
73.5	0.66	(33) [illegible] (34)	[illegible] (35)
61.5	0.67	(37) [illegible] (38)	[illegible] (39)
65.1	0.66	(41) [illegible] (42)	[illegible] (43)
91.5	0.70	(45) [illegible] (46)	[illegible] (47)
98.6	0.73	(49) [illegible] (50)	[illegible] (51)
62.7	0.66	(53) [illegible] (54)	[illegible] (55)

11. (C) multifunctional, high level, and diverse sensors, high level and diverse instrumentation equipment
(E) minicomputer, microcomputer
(Sys) high level automatic control system (responding control type, learning control type)
12. Development of natural gas and oil found in abundance in the high latitude regions of Canada and Alaska are developed and these will become effective supply bases for Japan
13. (+) political organizational role
14. (-) costs, investment, scale
15. (M) sea water and weather resistant (cold temperature resistant) high tensile strength steel
(C) line pipe for subcold regional use
(E) mining equipment for cold region use, drilling rig for cold region use, icebreaking tanker (including semisubmerged type)
(B) pipe line for cold regional use

[Key continued on following page]

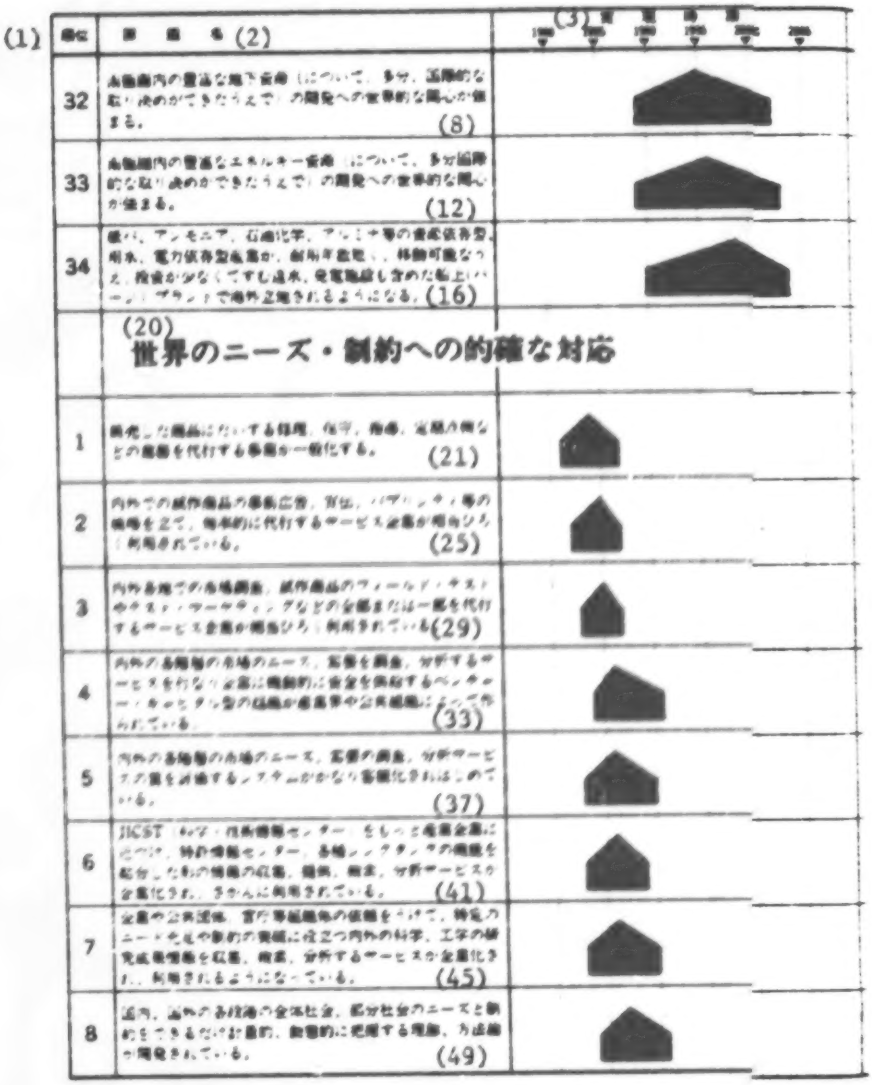
16. The processes of extracting oil and petrochemical raw materials from the abundant oil shale and tar sands of Canada and Brazil are industrialized, and Japanese industry will be involved in a number of joint ventures
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) steam
(E) heating and pressurizing, excavating, distillation, and separation equipment, steam pressurizing pump, gas and oil lifting pump
(B) pipe
Should price of crude oil go even higher, the possibility of using oil shale and tar sand becomes even better
20. High level educational service and entertainment service will be provided through the communication and broadcast satellite for Japanese assigned to overseas positions and their families
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (C) antenna for direct reception of satellite broadcast
(E) automatic program transmission unit, automated (unmanned) communication unit, automated (unmanned) broadcaster
(Sys) satellite communication system, satellite broadcasting system, adjustments to laws of countries of residence
24. Technology to convert peat and lignite found in Japan and in Southeast Asia to methane and methanol to produce chemical and petrochemical raw materials and fuel becomes industrialized
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (M) catalyst, heat and pressure resistant high tensile strength steel for reaction equipment
(C) tank, super low temperature tank
(E) methanation plant, methanol plant, utility plant, methane liquefaction plant, heat exchanger, pump, belt conveyer, pulverizer
(B) chemical plant
(Sys) loading and transporting system
Feasibility studies are being made
28. A system to convert waste products from the paper pulp industry, agricultural products, wood products, and food industry products into methanol which is used to generate electric power and to other nonpolluting fuel and chemical applications becomes practical
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (M) corrosion resistant building material, catalysts
(C) pipe
(E) belt conveyer, pulverizer, sectioning machine, high temperature and pressure methanol reaction facility, methanol reaction facility, pump, tank, methanol denaturation facility (to methane, CO, H_2)
While not high in calories, methanol is easy to transport
32. At least 90 percent of wastes and scrap agricultural and forestry products are recovered as hydrocarbon (cellulose, sugar, methane, methanol, etc.) and energy resources and reutilized
33. (+) industry and firm efforts
34. (-) costs, investment, scale

[Key continued on following page]

35. (M) cellulase (cellulose decomposing enzyme), search and improvement of bacteria for SCP manufacture
(C) pipe, biochemical sensor, corrosion resistant pipe
(E) cutting and pulverizing facility, solvent extraction device, fermentation vat, high temperature and pressure concentration and separation facility, solvent extraction facility, fermentation vat, high temperature and pressure methane and methanol forming reaction facility
36. High level educational service and entertainment service is beamed to employees dispersed in foreign assignment and their families through the communication and broadcast satellite
37. (+) industry and firm efforts
38. (-) costs, investment, scale
39. (C) antenna for direct reception of satellite broadcast
(E) automatic program transmission unit, automated (unmanned) communication unit, automated (unmanned) broadcaster, direct receiver for satellite broadcast
(Sys) satellite communication system, satellite broadcast system, adjustment to laws of countries of residence
40. Power generating ship, water production plant ship, and storage barges are widely used for overseas siting in areas where the infrastructure and utilities are inadequate
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (M) ion exchange membrane, reverse osmosis membrane, titanium metal, sea water resistant high tensile strength steel
(C) titanium tubes for making water, reverse osmosis module for water making, dialysis module for water making
(E) utility plant ship, large storage and containment barge, compact water making facility, compact electric generator, loading equipment
There are already developmental buds in Brazil and Indonesia
44. Intelligent robots with high degree of work capability become widely used to fight fires at high places, at sea, on the sea bottom, and at chemical and petrochemical plants where there is high risk from fires and fires in high rise buildings and ships
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (M) heat and corrosion resistant high tensile strength steel
(Sys) robot group control system, robot control system through radio
(C) hydraulic equipment, pneumatic equipment, intelligent robot-use light sensor array, voice pressure sensor array
(E) large output intelligent robot with internal power supply, high sensitivity TV camera, automated work tool exchange robot
48. A system to recover manganese nodules or red mud [literal] from the ocean depths of 3,000-5,000 meters of the Pacific for utilization as heavy metal mineral resources of metals such as nickel, copper, and cobalt becomes practical and widely used
49. (+) industry and firm efforts
50. (-) costs, investment, scale

[Key continued on following page]

51. (M) high specific strength sea water and abrasion resistant construction material, solvent, surfactant, heat and corrosion resistant construction material
(C) large diameter flexible hose
(E) manganese nodules, red mud, etc., recovery plant ship, dynamic positioner, computer, plant ship tender
52. Overseas siting, multinationalization and worldwide enterprise has proceeded to a considerable extent, a 24-hour control is introduced for headquarters management utilizing means such as satellite communication
53. (+) industry and firm efforts
54. (-) costs, investment, scale
55. (E) computer, communication controller, integrated communication exchange, intelligent terminal
(Sys) world computer communication network system, provision of domestic and international legal systems, automated unmanned packet communication system, communication satellite system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世界のニーズ・制約への的確な対応
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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Worldwide interest in the abundant underground minerals in the Antarctic sphere becomes enhanced (probably will require international handling)
9. (+) size of domestic and foreign demand
10. (-) costs, investment scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
72.5	0.67	⊕内外市場での需要の大きさ (9) ⊖費用・投資の額・規模 (10)	[illegible] (11)
79.7	0.68	(13) ⊕政治の組織的役割 ⊖費用・投資の額・規模 (14)	[illegible] (15)
54.3	0.62	(17) ⊕経営・企業の努力 ⊖費用・投資の額・規模 (18)	[illegible] (19)
86.2	0.75	⊕内外市場での需要の大きさ (22) ⊖費用・投資の額・規模 (23)	[illegible] (24)
70.9	0.72	(26) ⊕経営・企業の努力 ⊖費用・投資の額・規模 (27)	[illegible] (28)
78.9	0.72	⊕内外市場での需要の大きさ (30) ⊖費用・投資の額・規模 (31)	[illegible] (32)
59.6	0.66	(34) ⊕経営・企業の努力 ⊖費用・投資の額・規模 (35)	[illegible] (36)
75.4	0.72	(38) ⊕経営・企業の努力 ⊖費用・投資の額・規模 (39)	[illegible] (40)
87.5	0.73	(42) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (43)	[illegible] (44)
87.5	0.73	(46) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (47)	[illegible] (48)
100.0	0.71	(50) ⊕行政の組織的役割 ⊖費用・投資の額・規模 (51)	[illegible] (52)

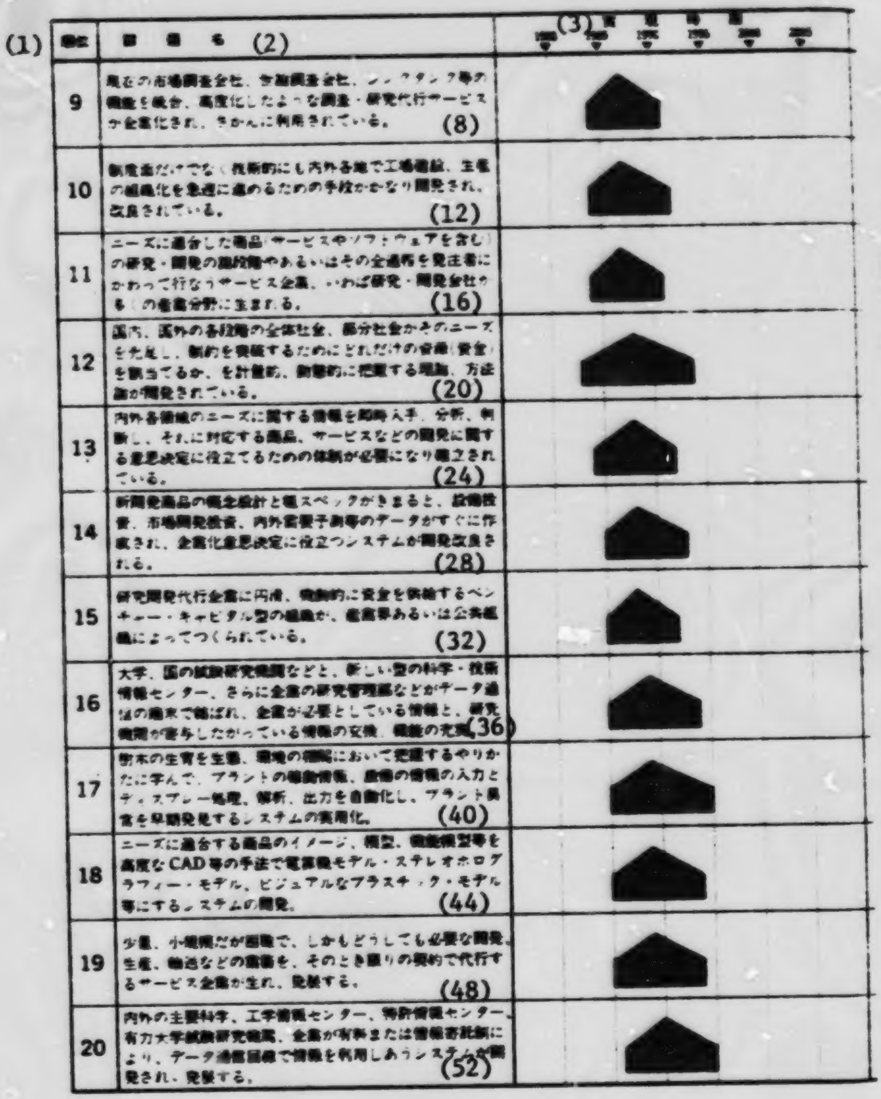
11. (M) low temperature resistant construction material
    (C) sensors
    (E) resources search machine, airplane, resources search satellite, test drilling machine
    (Sys) low temperature equipment system, remote sensing station, international consensus system
    (Ser) mineral lode search
12. Worldwide interest in the abundant energy resources in the Antarctic sphere becomes enhanced (probably will require international handling)
13. (+) political organizational role
14. (-) costs, investment, scale

[Key continued on following page]

15. (M) low temperature resistant construction material
    (C) sensors
    (E) resources searching machinery, airplane, resources search satellite, test drilling rig
    (Ser) natural gas, oil, coal resource search
    (Sys) low temperature equipment system, remote sensing system, international consensus system
    It is necessary to establish an international decision mode before the situation gets out of hand
16. Resources-dependent paper pulp, ammonia, petrochemical, and alumina industries and water and electric power dependent industries which are of short duration are located on movable barges where water making and power generation facilities are also located to provide low capital investment plants which can be sited at sea
17. (+) industry and firm efforts
18. (-) costs, investment, scale
19. (M) ion exchange membrane, reverse osmosis membrane, titanium metal, sea water resistant high tensile strength steel
    (C) titanium tube for making water, reverse osmosis module for water making, dialysis module for water making
    (E) plant ship, compact manufacturing plant for plant ship, utility plant ship
20. Reliable Response to World's Needs and Restrictions
21. Agency business which assumes repair, maintenance, guidance, and periodic inspections of products sold becomes a general practice
22. (+) size of domestic and foreign demand
23. (-) costs, investment, scale
24. (E) fabrication machine tool set convenient for mobile maintenance, mobile means for providing service to communication facilities
    (B) depot for parts, material, and equipment used in maintenance
    (Sys) instruction system for objective guiding of maintenance
    (Ser) maintenance agency service
    This is a promising business for the future
25. A service industry becomes used which prepares strategies for advertisement, propaganda, and publicity for test-manufacture goods and effectively serves as agent
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (E) intelligent terminal (including portable types), computer, polygraph (for grasping reaction measurements)
    (Sys) domestic and foreign market goods information data bank, domestic and foreign media data bank, simulation software, consumer psychology research (on domestic and foreign social situation)
    (Ser) advertising agencies
29. A service industry which conducts all or some market surveys and field tests or test markets new manufactured products becomes widely used at home and abroad
30. (+) size of domestic and foreign demands
31. (-) costs, investment, scale

[Key continued on following page]

32. (E) intelligent terminal (including portable types), computer, polygraph (for understanding reaction measurements)
    (Sys) domestic and foreign market goods information data bank, foreign and domestic media data bank, simulation software, consumer psychology research (on domestic and foreign social situation)
    (Ser) advertising agencies
33. Industry or public organs which provide venture capital for a business to survey and analyze needs and demands of the markets at various levels both at home and abroad are formed
34. (+) industry and firm efforts
35. (-) costs, investment, scale
36. (Sys) recognition of necessity, establishment and provision of system
    (Ser) fiscal service (venture capital service)
37. Evaluation system for assessing the quality of survey and analysis service of needs and demands of the markets at various levels both at home and abroad begins to be viewed in fairly objective manner
38. (+) industry and firm efforts
39. (-) costs, investment, scale
40. (E) computer
    (C) evaluation system development
    (Sys) joint research by economists, statistician, mathematician, and think tank, data bank, system evaluation model
    Humanities researchers from various countries are also important
41. Information collection, submission, search and analysis service which ties together a JICST (science and technology information center) more closely allied with production industry, patent information center, and various think tank capabilities is commercialized and widely utilized
42. (+) organizational role of administration
43. (-) costs, investment, scale
44. (C) large volume information recording medium
    (E) computer
    (Sys) industrial technology information collection, storage, search system; industrial technology situation analysis and prediction system
    (Ser) industrial technology information service, think tank service
    Dynamic data bank system will become major decisive factor
45. Service which collects, searches, and analyzes research results information from science and engineering sources throughout the world which can be useful to industrial and public groups and government offices and fulfill certain specific requests
46. (+) organizational role of administration
47. (-) costs, investment, scale
48. (C) pictorial communication medium, large volume information recording medium
    (E) computer facsimile, intelligent terminal
    (Sys) science and engineering data bank system, data communication system, pictorial communication system (such as facsimiles)
    (Ser) data bank service
49. Logic and methodology to grasp both quantitatively and dynamically the needs and limitations of the overall and local societies of the world are developed
50. (+) organizational role of administration
51. (-) costs, investment, scale
52. (E) computer
    (Sys) joint research by economist, social scientist, think tank; data bank, simulation model
    (Ser) think tank service. High degree of advances by the various social scientists also becomes necessary.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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Survey and research agency services which combine and raise to high level the capabilities of present market survey companies, public opinion survey companies, and think tank services becomes industrialized and widely utilized
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]・[illegible]条件	コ メ ン ト (7)
86.7	0.71	(9) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (10)	①コンピュータ、②経済学者・社会学者・市場調査企業・世論調査企業・シンクタンク等の共同研究、データバンク、シミュレーション・モデル、③市場調査サービス、世論調査サービス、シンクタンク・サービス。 (11)
82.1	0.71	(13) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (14)	②船上プラント・システム用船舶の標準化規格化、船上プラント・システム用プラントの標準化規格化、船上プラント・システム用ユーティリティ・プラントの標準化規格化。③船上プラント・システムのためのメンテナンス・サービス。 (15)
58.2	0.64	⊕内外市場での需要の大きさ (17) ⊖費用・投資の額・規模 (18)	②研究開発評価システム、研究開発管理システム。③研究開発ベンチャー・ビジネス、ベンチャー・キャピタル・ファイナンス・サービス。少数精鋭のアドホック・チームをいかにうまく組むか、が決め手。 (19)
86.2	0.69	(21) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (22)	①コンピュータ、②経済学者・社会学者・シンクタンクなどの共同研究、データバンク、シミュレーション・モデル。③シンクタンク・サービス。 (23)
86.0	0.70	(25) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (26)	①大量の情報記録媒体、①コンピュータ、インテリジェント・ターミナル、TV電話会議システム。②市場商品情報収集・管理・検索システム、市場商品需要分析・予測システム、データ通信システム。③市場商品情報サービス、シンクタンクサービス。 (27)
82.1	0.70	(29) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (30)	①大量の情報処理媒体、①コンピュータ、インテリジェント・ターミナル。②経営情報データバンク・システム、市場情報データバンク・システム、社会情報データバンク・システム、市場商品需要分析・予測システム。③市場調査サービス、シンクタンク・サービス、市場商品情報サービス。 (31)
50.0	0.65	(33) ⊕行政の[illegible] ⊖費用・投資の額・規模 (34)	②研究開発評価システム、研究開発管理システム。③ベンチャー・キャピタル・ファイナンス・サービス。 (35)
77.6	0.68	(37) ⊕行政の[illegible] ⊖費用・投資の額・規模 (38)	①[illegible]媒体、大量の情報記録媒体、①コンピュータ、ファクシミリ、インテリジェント・ターミナル。②科学技術情報評価システム、科学工学データバンク・システム、データ通信システム、画像通信システム、（ファクシミリなど）。③データバンク・サービス。 (39)
82.5	0.70	(41) ⊕[illegible]の努力 ⊖費用・投資の額・規模 (42)	①計測センサ（とくにAEセンサ）、①コンピュータ、AD-DA変換装置、ディスプレイ装置、計算システム。②プラント異常の[illegible]システム、プラント異常の[illegible]システム。異常[illegible]工学の体系的な高度な発展が必要。 (43)
67.3	0.68	(45) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (46)	①[illegible]媒体、大量の情報処理媒体、①コンピュータ、高性能プロッタ、3次元ホログラフィ・テレビ装置、3次元切削工作機械、CAD用インテリジェント・ターミナル。②高性能CADシステム、高級CAD言語ソフトウェア。 (47)
60.7	0.65	⊕内外市場での需要の大きさ (49) ⊖費用・投資の額・規模 (50)	①フレキシブル・マルチパーパス・プラント（プロセス主体）、フレキシブル・メカニカル生産プラント（メカニカル加工）、ブロック・ビルディング方式輸送機器、コンピュータ、通信網。高度な少数精鋭のアドホック・チームをいかに組むかが決め手。 (51)
76.3	0.69	(53) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (54)	①[illegible]通信媒体、大量の情報記録媒体、①コンピュータ、ファクシミリ、②情報クリアリング・ハウス・システム、情報評価システム、科学工学データバンク・システム、データ通信システム、画像通信システム。③情報クリアリング・ハウス・サービス。 (55)

11. (E) computer
(Sys) joint research by economist, social scientist, market survey business, public opinion survey business, and think tank, data bank, simulation model
(Ser) market survey service, public opinion survey service, think tank service
12. Means to rapidly advance the organization of plant construction and production at various sites both domestic and abroad not only systematically but also technologically become developed and improved
13. (+) industry and firm efforts
14. (-) costs, investment, scale
15. (Sys) standardization and specification for ships to house shipboard plant system, shipboard plant system standardization and specification, shipboard system utility plant standardization and specification
(Ser) shipboard plant system maintenance service

[Key continued on following page]

16. A research and development company that is a service industry that takes over the entire process or the various steps of research and development of goods (including service and software) according to need becomes a common thing in the industrial area
17. (+) size of domestic and foreign demand
18. (-) costs, investment, scale
19. (Sys) research and development evaluation system, research and development management system
(Ser) research and development venture business, venture capital finance service
The way in which small, sharp ad hoc teams operate will be the key
20. Logic and methodology are developed to quantitatively and dynamically determine the capital needs that are required for the entire society or local society at home and abroad to fulfill its needs
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (E) computer
(Sys) joint research by economists, social scientists, think tanks, data bank, simulation model
(Ser) think tank service
24. A system which serves decision-making with respect to prompt acquisition of information related to needs of various regions both at home and abroad and the development of goods and services to respond to these needs becomes necessary and is developed
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (C) large volume information recording medium
(E) computer, intelligent terminal, TV telephone conference system
(Sys) market goods information collection, storage, search system, market goods situation analysis and prediction system, data communication system
(Ser) market goods information service, think tank service
28. A system useful for industrialization decision-making is established and improved so that once the conceptual design and crude specs of a newly developed product are specified, the data for forecasting plant and equipment investment, market development investment, and domestic and foreign demand are rapidly compiled
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (C) large volume information recording medium
(E) computer, intelligent terminal
(Sys) fiscal environment data bank system, market environment data bank system, social environment data bank system, market goods situation analysis and prediction system
(Ser) market survey service, think tank service, market goods information service
32. Venture capital type structure to provide capital in smooth and dynamic manner to research and development agency businesses is formed by the industry or some public organization
33. (+) organizational role of administration
34. (-) costs, investment, scale

[Key continued on following page]

35. (Sys) research and development evaluation system, research and development management system
(Ser) venture capital finance service
36. Universities and national experimental research organs, new-type science and technology information centers, and industry's research management sections are tied together by computer communication terminals and information needed by industry and information being supplied by the research organs are exchanged and their capabilities are exploited
37. (+) organizational role of administration
38. (-) costs, investment, scale
39. (C) picture communication medium, large volume information recording medium
(E) computer, facsimile, intelligent terminal
(Sys) science and technology information evaluation system, science and engineering data bank system, data communication system, picture communication system (such as facsimiles)
(Ser) data bank service
40. Practical development of a system that studies the interrelationships between ecology and environment on the growth of trees, automates input and display processing, analysis, and output of plant growth information and facilities information, and quickly spots any abnormal plant growth situation
41. (+) research and development establishment efforts
42. (-) costs, investment, scale
43. (C) various sensors (particularly AE sensors)
(E) computer, AD-DA transducer, display device, instrumentation system
(Sys) early stage statistical and stochastic detection system for plant abnormalities, early detection system for plant ecological abnormalities. Systematic and high development of abnormal incident engineering becomes necessary
44. Development of a system to take image, model and functional model of a product which fits a given need to make computerized models, stereo holographic models, or visual plastic models through high level CAD methods
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (C) pictorial information processing medium, large volume information processing medium
(E) computer, high performance plotter, 3-dimensional holographic TV, 3-dimensional cutting machine tool, CAD intelligent terminal
(Sys) high performance CAD system, high performance CAD software
48. A service industry is created and developed which contracts the necessary development, production, and transportation functions for small volume products that are difficult to produce in small lots for a particular occasion
49. (+) size of domestic and foreign demand
50. (-) costs, investment, scale
51. (E) flexible multipurpose plant (process production), flexible mechanical production plant (mechanical work), block building mode transport equipment, computer, communication terminal
How high-level, small, sharp ad hoc teams are used will be key

[Key continued on following page]

52. A system is developed in which major science and engineering centers both domestic and foreign, patent information centers, highly regarded university research organs, and industries enter into toll or information deposit systems to utilize information as part of a data communication network
53. (+) industry and firm efforts
54. (-) costs, investment, scale
55. (C) pictorial communication system, large volume information recording medium
    (E) computer, facsimile
    (Sys) information clearing house system, information evaluation system, science and engineering data bank system, data communication system, pictorial communication system
    (Ser) information clearing house service

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TECHNOLOGY DEVELOPMENT IS URGENT BUSINESS, DO NOT SLIGHT IMPROVEMENTS IN AWARENESS SYSTEM

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 126-137

[Article by Kazuo Tomiyama]

[Text] Education, Culture, Leisure

Urgent Problems in Primary and Middle Education

The Japanese have always been dedicated in education of their children and have also put emphasis on their own training and education.

While there is need to revise overemphasis on school training which leads to disruptive results, humans constitute the one resource which a resource-poor country such as Japan can boast of.

The remarkable development of Japan since the Meiji restoration is thought to have resulted from the large volume of its studious and high-educational-level labor force. When the future environment and situation of this country is considered, the further development of education and training based on practical situations and cultural transmission are thought to be very important subjects. The results of questionnaire response in this present technology prediction survey were not elicited from educational people or housewives but were obtained from various panelists who represent the top people in industry, business, and local government. Despite this situation, the "importance" of the educational and cultural section scored the highest. This was indicative of the general tenor.

Japan's education at the present time is faced with vast violent movement and changes along two fronts. The solutions to these problems have not been obtained as yet. The first area is the major shakeup to the social and cultural evaluation system as the result of the social, cultural, economic, and technological changes in Japan and the world and the defeat in World War II. There was enormous shift in population from towns and villages to the urban centers, and the resulting manpower shifts between occupations, development in urbanization, and sudden changes in social and living environment were such that what was once comparatively simple educational and training systems were faced with situations they could no longer cope with. The establishment of a truly democratic educational system based on individual self-awareness and autonomous capability is a difficult problem, yet this is a problem which must be resolved as quickly as possible through the efforts of the entire Japanese society.

The other area is the tremendous increase in volume of information that has to be transmitted from generation to generation as the result of the severe changes and developments taking place in all areas and regions along with the high quality of the contents and their complexities, and the former educational methods were unable to effectively transmit, fix, and activate the information.

The spectacular advances in the area of science and technology were particularly noteworthy in the quality and quantity of high level information that the primary and middle school students had to assimilate. As a result, there was a major polarization between average students and those higher level students who sought greater depth of information.

In order that Japan's science, technology, culture, government, industry, and economics follow the pathways of leading countries in the generations to come, there is need for early resolution of this problem. Subjects aimed at elevating the group level along with efforts to accommodate the gifted individuals and hone their capabilities are necessary. This involves not only improvements in the system and people's view of education but development and improvement of support technology for education and training which can and must play major roles.

Need for "Career Training" System

Rapid and vast shifts in population and occupations, development of the urbanization phenomenon, and sharp changes in the living and social environment have had major effects on the adult student where the development of homes is concerned. At the same time, it is said that the leading nations have entered a period of long term low rate economic growth, but there are still some violent changes and movements in their societies which will continue to take place. If Japan is to avoid contracting the so-called "Americanization disease" which involves falling into a long term social stagnation but opts instead for an active role in all-out participation in international industry, there is need to elevate its environmental responding strength through tireless training and reeducation of its industry, economic personnel, and academicians.

This will require improvements on the systematic and social organizational fronts as well as developments and improvements on the technological front. In addition, Japan will be experiencing a higher rate of speed in its transition to an older society compared to other leading countries, and this is a problem that will not be resolved simply by welfare policies either economically, socially, or psychologically. There is need for training and reeducating the young in their regard for aging to provide flexibly responding forces and the assurance of a workable environment. In this respect, not only formal education but social education and special occupational training areas require quick development and improvement in system and technology for the so-called "career education" system.

Japan has since ancient times built up its independent culture which has had considerable impact on the world. Now the situation in recent times had been that its worldwide development in high level economic growth trade has been so intense yet its appearance on the world's stage has been somewhat delayed such that Japan's experience on wide cultural exchange has been found wanting as a result of which its cultural areas have not been recognized as much as its economic and production fronts. It cannot even be said that the various facets of its culture are adequately esteemed within its own country.

If not only the people's customs, arts, and entertainment but the science, technology, and production activity are to readily bring the people to cultural efforts and to incite a feeling in this direction, there must be development and improvement of technology which must play a major role.

The living standard of a nation's people is judged not only by the per capita income or the level of its material possessions but also on the extent or fraction of its leisure time. At the present time, the working hours of a Japanese worker can be classed toward the shorter end while the leisure hours are toward the longer side. In this respect Japan is very productive for the short time of work involved. The problem here is that this shortening in working time and increased leisure time were realized in a very short period, and there has not been sufficient preparation on the part of society to cope with this vast increase in leisure, and relaxed enjoyment of leisure, daily mental and physical refreshment, and revitalized activity are practices which have not fully developed as yet.

Japan has very limited land area with most of its people concentrated in the urban areas, and it is said that 90-95 percent of the people will be concentrated in the cities by the end of this century. There is need for facilities to take care of leisure activities such as amusement facilities, amusement equipment, and associated structures provided by the cities. There is also need for more spacewide activities such as availability of fields and mountains and the seashore which are outside the cities and which are long term leisure activities for which proper equipment and facilities need to be provided. This will require systems and public finances as well as technology development and improvement. The development and provision of leisure facilities and equipment must be given more and more importance from here on.

The Ever Enlarging Education Industry

Let us now look at the technology development subject groups related to elevating Japan's education, culture, and leisure levels and the periods when these developments are expected to occur as indicated by the Research Institute of Industrial Materials study.

The area of schools, social and occupational special educational systems provision is expected to see a spectacular expansion in nighttime, seasonal, and correspondence course education to provide general education, expanded visual education, and special education in addition to the ordinary academic education during the 1986-1990 period. A single set of tests will be used to give a status essentially the same as having completed the regular school, and this will be accepted by society. The production of software for special training in secondary and higher education will be provided by a special industry, and large sales volume will be involved. The handling of new machines and devices or the promotion of new endeavors will be handled with great presence and efficiently through the development and improvement of simulators.

The 1991-1995 period is expected to see the present difficult-to-enter but easy-to-graduate schools of higher education undergo major change and become easy-to-enter but difficult-to-graduate from along the lines of the American and Soviet schools. Students will be expected to study, and the necessary hardware for making more efficient the acquiring of knowledge, imparting of information, judging learning effects, and individual learning will be developed, produced, and improved by an industry which will be developed. Various occupations such as CAI (computer aided instruction), development of facilities and equipment for special education and their installation will become important industrial activities. The simulators to train production, transport, and traffic personnel will give the feel of the actual thing.

Software for occupational training for special occupations offered at secondary and higher schools is expected to become export products in the 1996-2000 period and develop to a considerable scale.

The area of raising the levels of leisure services is expected to involve video tapes (includes stereo TV) which can pass along much more information in addition to the usual books, magazines, and records, and these are expected to become important information media in the 1986-1990 period.

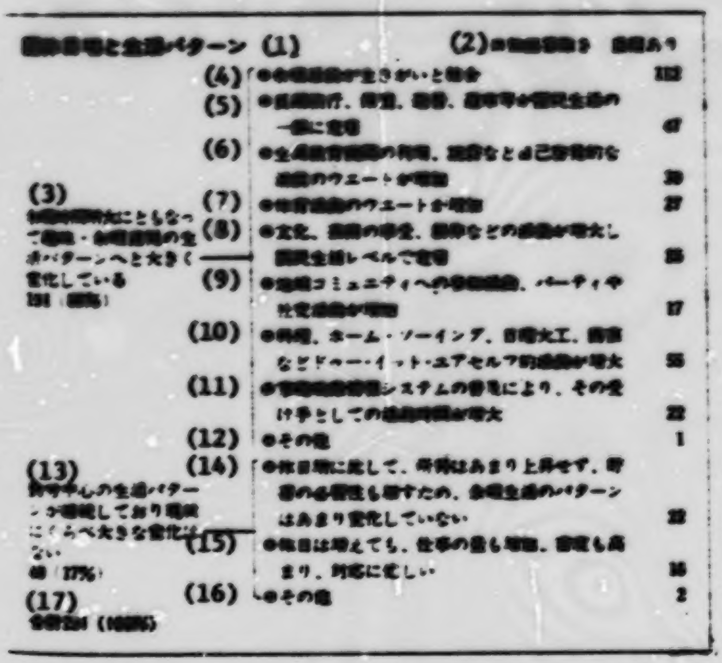
The 1991-1995 period will see video tapes (including stereo TV) owned or rented, and facilities to view these tapes will play the role that libraries play today. Advances in communication technology and microprinting technology will enable science texts and materials to be made available between national and international libraries by a service operating in an on-line and real time manner. The overcrowding of Japan's cities will not be remedied overnight, and the cities will be involved in developing and industrializing (including free or low cost availability offered by public organs) space and time economy leisure service. District, occupational, or common interest type activities to recharge the spirit will be fostered by company, neighborhood, or occupational clubs. Family leisure facilities alined with nature and providing camp sites, fishing streams, seashores, hunting grounds, or field athletics; recreational facilities where man can hobnob with nature; and outdoor activities requiring teamwork will be some of the leisure activities which will be offered.

Healthy competitive spirits will be fostered by games and sham events in the 1991-1995 period, and equipment and facilities to catalyze such spirits will be developed.

Long term durable leisure facilities where excessive conveniences are not available and where considerable labor is required will become popular over the whole country in 1991-1995. People will spend summers in sparsely settled areas making charcoal or putting in 2-3 weeks of labor helping raising farm animals in some of the living participation time leisure activities that will become adopted.

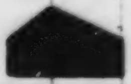
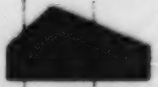
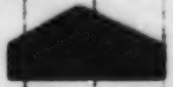
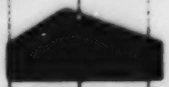
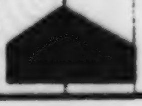
Sunday carpentering clubs by regions or occupations will be organized in the 1996-2000 period to construct villas and mountain chalets, some of them requiring several years, in sparsely populated regions in a leisure activity involving both interest and profit.

The 2001-2005 period is expected to see participation in international activities such as going to newly developing countries or already developing countries to work for fairly long periods in building and social development activities such as in agricultural or fishing villages.



Key:

1. Increase in rest days and activity pattern
2. Excluding nonrespondents, some duplications
3. There is great change to interest and leisure emphasis living patterns with increase in leisure time
4. Leisure activities are tied to reinvigoration
5. Long term travel, recreation, escape from heat, escape from cold become fixed patterns in segments of the people
6. Increasing weight of self-development activities such as utilization of career education organs and books
7. Increasing weight of physical training activities
8. Increased activities in reception and creation of culture and the arts which become affixed to the people's living levels
9. Increase in district community activities, parties, and social activities participation
10. Increase in do it ourselves activities such as home cooking, home sewing, Sunday carpentry, and entertainment
11. Greater use of home pictorial information system results in greater active time
12. Other
13. The work-centered living pattern continues, and there are no major changes for the present
14. Income does not go up much compared to increase in leisure time, and the increased need for savings are causing no great changes in the leisure patterns
15. While leisure time increases, workload also increases and becomes more intense resulting in little incentive for leisure
16. Other
17. Total 231 (100%)

(1)	課 題 名 (2)	(3) 実 現 時 期
	(8) **学校・社会・職業教育**	
1	労働者単独あるいは上級技術者の指導のもとに、作業工程、設備、労働方法などの改善、開発のための考案を行なうことが奨励され、成果に応じて報償する制度が一般化する。 (9)	
2	海外で働く機会が大いにふえるのにともない外国語、海外の生活習慣、仕事のやり方などを身につけさせるためのソフトウェア（教材）の開発、改良が大きな事業になる。 (13)	
3	文化的、社会的、経済的、国際的環境変化に対する人間の可塑性、適応力を改善するための教育が重要になる。 (17)	
4	一般教養、視野拡大、専門教育の拡充、更新などのための夜間、季節、通信などの社会教育が飛躍的に拡大され、一定の試験のもとに普通の学校教育と同じ資格が認定され、社会的に通用するようになる。 (21)	
5	中等、高等、専門職業教育などのための職業専門教育用のソフトウェア作成が産業部門として成立し、売上高が大きくなっている。 (25)	

Key:

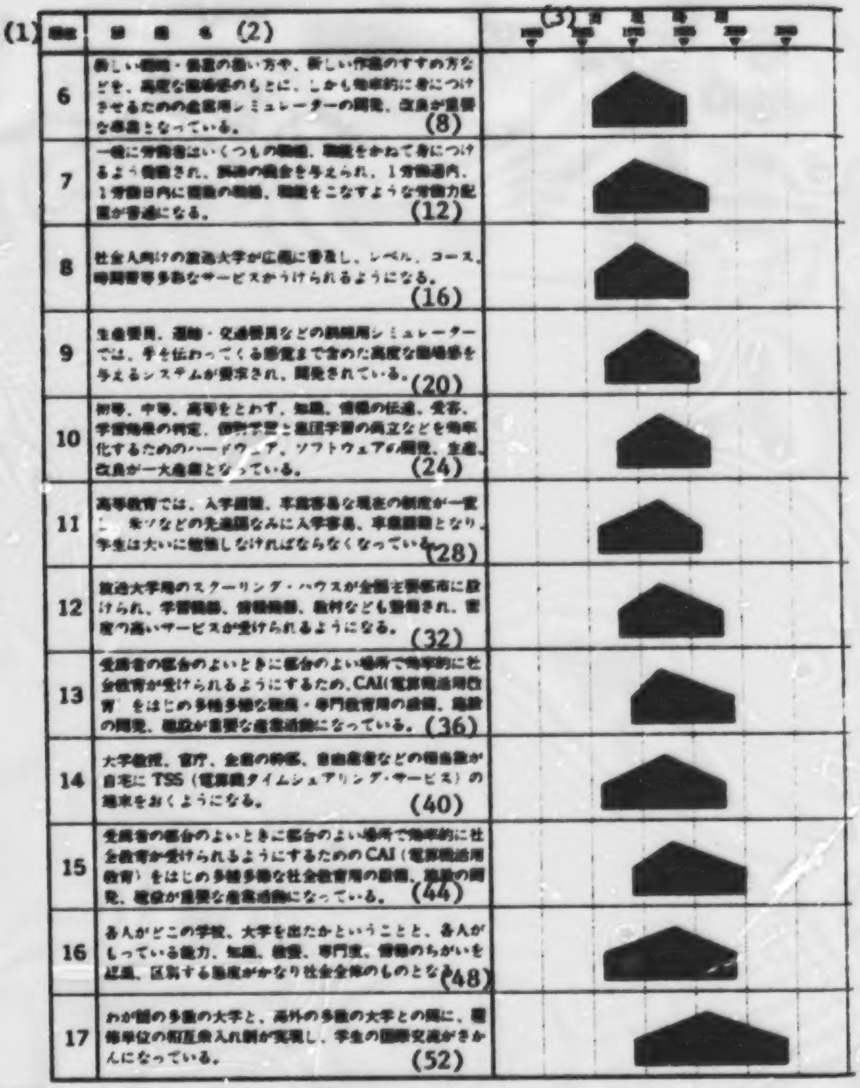
1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Schools, Society, Occupational Education
9. Efforts on the part of individual worker or technologist to improve or develop work process, facility, or work method is encouraged, and awards are given for good results in the system which becomes highly developed
10. (+) industry and firm efforts
11. (-) costs, investment, scale
12. (E) seeing and hearing educational equipment
    (B) facilities for extracurricular research and innovations by workers (independent or joint)
    (Sys) data bank for self-learning or self-training, evaluation system or innovative results, psychological development system for constructive development
    Plays large role in preventing labor scarcity
13. Large increase in work opportunities abroad require development and improvement of software for learning foreign languages and customs
14. (+) industry and firm efforts
15. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]・[illegible]	コ　メ　ン　ト (7)
91.1	0.74	(10) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (11)	●[illegible]。●[illegible]のための[illegible]研究・学習のための[illegible]（独立または併設）。㋛[illegible]のためのデータバンク、学習成果の評価システム、創造性開発のための心理[illegible]システム。[illegible]にも大きな役割を果たす(12)
84.1	0.73	(14) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (15)	●ビデオ・ディスク、ビデオ・テープ、映画フィルム。●反応測定機械、ビデオ関係[illegible]・[illegible]装置、[illegible]撮影・[illegible]装置、製版・印刷・製本機械。㋛各界[illegible]・教育者・産業人・外国人による共同研究、カリキュラム・プログラムの作成。 (16)
87.0	0.71	(18) ⊕国民・住民の意識・コンセンサス ⊖費用・投資の額・規模 (19)	●[illegible]教育機械。●独立または併設の環境変化への適応力・可塑性改善教育施設。㋛心理学者・教育学者・社会学者等の共同研究、多種多様なカリキュラム・プログラムの作成、多種多様な教材の作成。 (20)
87.2	0.72	(22) ⊕国民・住民の意識・コンセンサス ⊖国民・住民の惰性・抵抗 (23)	●[illegible]。●独立または併設の生涯教育のための学校またはスクーリング施設。㋛多種多様なカリキュラム・プログラムの作成、多種多様な教材の作成。㋛カリキュラム・プログラムの作成、教材の作成、産業専門家・非教育分野の人への教師の委嘱。 (24)
76.1	0.70	(26) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (27)	●ビデオ・ディスク、ビデオ・テープ、映画フィルム。●反応測定機械、ビデオ関係機器・[illegible]装置、[illegible]撮影装置。㋛専門職業教育家・心理学者・教育者・産業専門家等の共同研究、カリキュラム・プログラムの作成。教材やプログラム学習用プログラムの製作が大きな事業に。 (28)

16. (C) video disk, video tape, movie film
(E) response measurement device, video related record, reproducing facility, picture related projecting and reproducing facility, frame making, printing, and compiling facility
(Sys) joint research by people from different industries, educational institutions, industries, and foreign countries, construction of curriculum program
17. Education to improve man's flexibility and responsive power to cope with changes in the cultural, social, economic, and international environment becomes important
18. (+) people's awareness, consensus
19. (-) costs, investment, scale
20. (E) audio and visual teaching machine
(B) teaching facilities to improve response and flexibility or independent or concerted environmental changes
(Sys) joint research by psychologists, educatoru, and social scientists, construction of multivaried curriculum program, preparation of educational material
21. Nighttime, seasonal, and communication type extracurricular education undergo major expansion for general education, increase field of vision, and expansion or renovation of special education, and a fixed set of exams is used to give status equal to having had formal education accepted by society
22. (+) people's awareness, consensus
23. (-) people's inertia, resistance

[Key continued on following page]

24. (E) audio visual machines
(B) schools or screening facility for individual or group extracurricular education
(Sys) multivaried curriculum program formulation, multivaried educational material preparation
(Ser) curriculum program formulation, educational material preparation, shift of teachers to industrial specialty jobs and noneducational areas
25. The production of software for special occupational education in middle and upper schools and specialist retraining schools becomes an industrial specialty with considerable sales volume
26. (+) industry and firm efforts
27. (-) costs, investment, scale
28. (C) video disk, video tape, movie film
(E) reaction measurement device, video related record and reproducing facility, video projecting equipment
(Sys) joint research by special occupation specialist, psychologist, educator, and industrial specialist, curriculum program formulation. Educational material and program formulation or program training becomes large businesses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(48)
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(52)

Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Development and improvement of production simulators efficiently and under high degree of urgency related to use of new machines and equipment and promotion of new operations becomes an important business
9. (+) industry and firm efforts
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) 促進・抑制条件	コ メ ン ト (7)
84.1	0.70	(9) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (10)	Ⓜ油圧機器、空気圧機器、Ⓒシミュレータ、コンピュータ、ビデオ関係撮影・複製・再生機器装置、振動・騒音・発生装置、Ⓢ産業教育者・産業専門家等の共同研究、高度シミュレーションによる実習時間の短縮、再教育への利用は効果大。 (11)
58.6	0.68	(13) ⊕産業・企業の努力 ⊖国民・住民の惰性・抵抗 (14)	Ⓢ教育者・労働心理学者・労働生理学者・産業専門家等の共同研究、トレーナーとインストラクターの養成、関係制度の整備、労働力不足防止にも効果絶大。 (15)
86.4	0.71	(17) ⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (18)	Ⓒ放送大学用多様TV放送関係設備、Ⓒスクーリング施設（独立または併設）、Ⓢ教育学・各科学・工学・社会科学・心理学等の専門家の共同研究、カリキュラムとプログラムの作成、教材の作成、学習・教育用データバンク。 (19)
86.0	0.71	(21) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (22)	Ⓜ油圧機器、空気圧機器、Ⓒシミュレータ、コンピュータ、ビデオ関係撮影・複製・再生機器装置、振動・騒音・発生装置、Ⓢ産業教育者・産業専門家等の共同研究によるシミュレータの計画設計・スキットの設計製作、Ⓢシミュレーション用スキットの製作。 (23)
71.1	0.69	(25) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (26)	Ⓒ多量の磁気ディスクとテープ、各種視聴覚教材用資材、Ⓒ学習反応・教育効果判定機械装置、コンピュータ、個別教育ブース、Ⓢ教材・学習用データバンク、カリキュラム作成、プログラム作成、教材作成、教育機器産業は大規模化する。 (27)
93.6	0.71	(29) ⊕国民・住民の認識・コンセンサス ⊖国民・住民の惰性・抵抗 (30)	Ⓒ大学設備の外延的拡大・内包的充実、Ⓢ制度の見直し、各種国家試験制度の確立・充実、教員資格認定制度の確立・充実。大学生の多数がこんなに勉強しない国は先が思いやられる（？） (31)
84.1	(33) 0.70	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (34)	Ⓒ学習反応・教育効果判定機器、個別学習ブース（インテリジェント・ターミナル、ディスプレイを備えた）、視聴覚教育機器、Ⓒスクーリング施設（独立または併設）、Ⓢインストラクターとサイドの養成・組織化。 (35)
86.7	0.68	(37) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (38)	Ⓒ多量の磁気ディスクとテープ、各種視聴覚教材用資材、Ⓒ学習反応・教育効果判定機械装置、コンピュータ、個別教育ブース、各種シミュレーション・システム、Ⓒスクーリング施設、Ⓢ教育・学習用データバンク、カリキュラム作成、プログラム作成。 (39)
69.8	0.70	(41) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (42)	Ⓒ安価で使いやすいTSS端末（入出力タイプライタからインテリジェント・ターミナルまで）、Ⓢ公衆電通網によるデータ通信システム、ⓈTSSサービス、各種情報の検索にも大きな役割を果たしている。 (43)
77.8	0.69	(45) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (46)	Ⓒ多様の磁気ディスクとテープ、各種視聴覚教材用資材、Ⓒ学習反応・教育効果判定機械装置、コンピュータ、個別教育ブース、各種シミュレーション・システム、スクーリング施設、Ⓢ教育・学習用データバンク、カリキュラム作成、プログラム作成、教材作成。 (47)
91.1	0.70	(49) ⊕国民・住民の認識・コンセンサス ⊖国民・住民の惰性・抵抗 (50)	Ⓒ視聴覚資料、Ⓒスクーリング施設、Ⓢ各分野・各グレードの資格能力認定制度の定着、年功序列制（先任制）と能力重用主義との融和、多種多様なカリキュラムとプログラムの作成、多種多様な教材の作成。 (51)
85.4	(53) 0.68	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (54)	ⒸLL（語学習得）機器の高度化と普及、ⒸLLラボの普及（独立または併設）、Ⓢ制度の国際的平準化、カリキュラム水準の平準化、語学教育の多様化・高度化・実用化、ⓈLL教材の多様化・高度化。先進国とだけでなく、途上国、中進国との相互乗入れもぜひ必要。 (55)

11. (M) hydraulic equipment, pneumatic equipment
(C) simulator, computer, video related photography, reproduction, and duplication equipment, vibration and noise generator
(Sys) joint research by industrial educator and industrial specialist, cutting down training time by use of high level simulators, very effective for use in retraining
12. Workers generally are encouraged to develop and train for several occupational capabilities so that they can perform different functions during the course of a work week or work day, and this practice becomes common
13. (+) industry and firm efforts
14. (-) people's inertia, resistance
15. (Sys) joint research by educators, labor psychologists, labor physiologists, and industrial specialists; developing trainers and instructors; provision of related system
Effect very great in preventing shortage of labor

[Key continued on following page]

16. A broadcasting university directed to people becomes popular and provides various services according to level, course, and time differentials
17. (+) people's awareness, consensus
18. (-) costs, investment, scale
19. (E) multiple TV broadcast equipment facilities for broadcast university
(B) screening facility (independent or joint use)
(Sys) joint research by educators, scientists, engineers, social scientists, and psychologists; curriculum program construction, construction of educational material, training and education data bank
20. Simulators for training production, transport, and traffic personnel will give the actual feel of the job at hand and provide high degree of realism in the system that will be required and developed
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (C) hydraulic equipment, pneumatic equipment
(E) simulator, computer, video related picture making, duplicating, and regenerating equipment facility, vibration and noise generator
(Sys) industrial educator and industrial specialist enter into joint research on simulator plans and designs, design and fabrication of skits
(Ser) production of skits for simulation use
24. Development, production, and improvement of hardware and software to make efficient the individual and group training on transmission, reception, and judging learning effect of knowledge and information at primary, secondary, and advanced levels will become a large business
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (C) large volume magnetic disks and tapes, various visual and audio educational material
(E) machine facility to judge learning reaction and educational effect, computer, individual educational booths
(Sys) educational material and training use data bank, curriculum construction, program construction, teaching material production
Educationally based industries will become big time
28. There will be a change from the difficult-to-enter but easy-to-graduate upper level school system of today to an easy-to-enter but difficult-to-graduate school style patterned after American and Soviet schools where the students must study
29. (+) people's awareness, consensus
30. (-) people's inertia, resistance
31. (B) external expansion and internal beefing up of university libraries
(Sys) restructuring of system establishment and operation of various government test systems, establishment and operation of teacher's status establishment system
Is not a country whose college students do not follow such a course in for bad times (?)
32. Screening houses for broadcasting universities are established in the major cities around the country where training equipment, information equipment, and teaching materials are provided to offer highly intensified service
33. (+) people's awareness, consensus
34. (-) costs, investment, scale

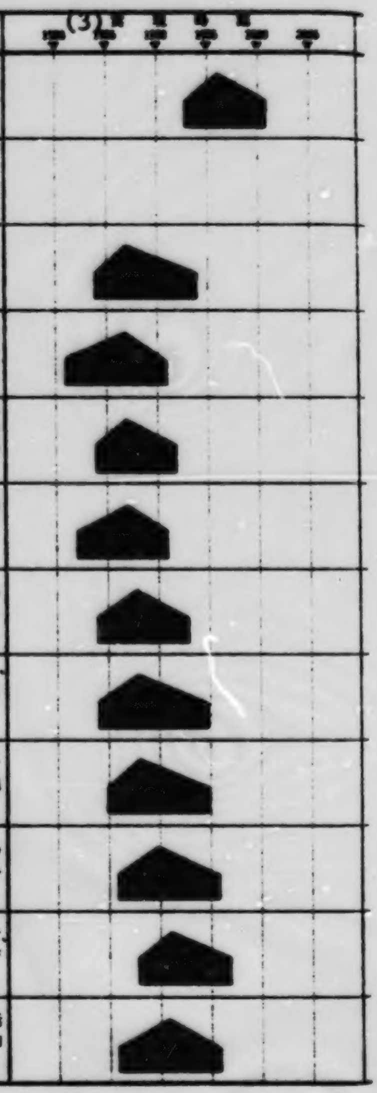
[Key continued on following page]

35. (E) learning reaction and educational effects judgment equipment, individual training booth (with intelligent terminals, display), visual and audio educational equipment
(B) screening facility (independent or joint use)
(Sys) training and organization of instructors
36. Equipment, facilities development, equipment for special education, and important buildings including CAI (computer aided instruction) where education will be provided efficiently at the convenience of the student will become an important business activity
37. (+) industry and firm efforts
38. (-) costs, investment, scale
39. (C) large volume magnetic disks and tapes, various visual and audio educational material
(E) learning reaction and educational effect judgment machine facility, computer, individual education booth, various simulation systems
(B) screening facility
(Sys) education and training data bank, curriculum construction, program construction
40. A substantial number of university professors, government officials, industrial cadre, and independent businessmen will have TSS (computer time sharing service) terminals at their homes
41. (+) industry and firm efforts
42. (-) costs, investment, scale
43. (E) low cost and easily usable TSS terminal (from input-output typewriter to intelligent terminal)
(Sys) data transmission system through public telephone lines
(Ser) TSS service
Also plays large role in search for various information
44. Equipment for social education, development of facilities, and necessary construction including CAI where education will be provided efficiently at the convenience of the student will become an important business activity
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (C) various magnetic disks and tapes, various visual and audio educational material
(E) learning reaction and educational effect judgment machine facility
(Sys) education and training data bank, curriculum construction, program construction, educational material construction
48. Attitude to recognize and discriminate whether a person has completed what school or university and what his capabilities, knowledge, training, specialties, and information are becomes fairly common in the social system
49. (+) people's awareness, consensus
50. (-) people's inertia, resistance
51. (E) audio visual machines
(B) screening facility
(Sys) establishment of status, capability judging systems of various areas and various grades, fusion of annual merit raise system (seniority system) and capability principle system, various types of curriculum and program construction, construction of various educational material

[Key continued on following page]

52. Interchanges of students between universities of Japan and universities in a number of foreign countries become practical, and international exchange of students becomes very popular
53. (+) people's awareness, consensus
54. (-) costs, investment, scale
55. (E) LL (language learning) equipment of high class finding wide use
    (B) wide use of LL laboratories (independent or joint use)
    (Sys) international normalization of systems, standardization of curriculum, multiple nature, high level, widely used language training
    (Ser) multiple nature and high level LL educational material, need to have mutual interplay not only with leading countries but developing and middle level countries as well

(1) [illegible]	[illegible] (2)
18	中等、高等、専門家用教育などのための職業専門教育用のソフトウェアが輸出商品として、相当の規模に達している。 (8)
	(12) 文化・余暇生活
1	キャンプ・サイト、魚釣り用の川岸、海岸、狩猟場、フィールド・アスレチックなどの設備をそろえた、自然にとけこんだ形のファミリー・レジャー施設がひろく普及している。 (13)
2	もちろん、従来からの旅行、外国旅行、観光、温泉保養なども、滞在期間が長く、実質的になり、多様化、個性化しつつ存続し、発展している。 (17)
3	これまでの書籍、雑誌、レコードなどのような文化を享受するための情報媒体のほかに、より広範囲な、より多くの情報を伝えるビデオ・テープ（立体視テレビ用を含む）が重要な情報媒体になっている。 (21)
4	老人や子供だけでなく、地域的、職域的に、あるいは趣味を通じて心の交流をひろげ、深めるのに役立つような社交クラブ組織がつよく要求される。 (25)
5	日本人も隣近所や職場での落着いた家族ぐるみのつきあいを相当やれるようになり、あまり費用のかからないホーム・パーティーなどをたのしめるようになっている。 (29)
6	わが国の都市の過密化傾向は一朝一夕には直らないから、都市では空間節約型、時間節約型の余暇サービスと施設の開発、企業化（公共機関による無料、低廉なものを含めて）がつよく要求される。 (33)
7	自然志向型のレクリエーションと、人間的ふれあい、チームワークのかん養をめざす野外活動を総合する余暇施設がひろく利用される。 (37)
8	人間の健全な闘争心や競争心をゲーム、模擬イベントの中で発揮させ、カタルシスをもたらすような各種の野外でのゲームランドの開発がつよく望まれる。 (41)
9	郷土や地域の歴史、社会、経済、文化について、1人で、またグループで研究し、記録し、発表する施設と設備が各地で一般的につくられる。 (45)
10	夏季など過疎地や新開発地で就働き、農耕、家畜の世話などに2～3週間をまとめて費やすような生産活動参加型の余暇生活の過ごし方の定着。 (49)



Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Software for special occupational training in secondary and higher schools, and special schools becomes an export product which grows into considerable scale
9. (+) industry and firm efforts
10. (-) costs, investment, scale

[illegible] (%) (4)	[illegible] (5)	[illegible] (6)	コ メ ン ト (7)
53.5	0.63	(9) ⊕[illegible] ⊖[illegible] (10)	[illegible] (11)
91.5	0.73	(14) ⊕[illegible] ⊖[illegible] (15)	[illegible] (16)
95.7	0.75	(18) ⊕[illegible] ⊖[illegible] (19)	[illegible] (20)
95.2	0.73	(22) ⊕[illegible] ⊖[illegible] (23)	[illegible] (24)
93.3	0.72	(26) ⊕[illegible] ⊖[illegible] (27)	[illegible] (28)
89.4	0.72	(30) ⊕[illegible] ⊖[illegible] (31)	[illegible] (32)
80.0	0.69	(34) ⊕[illegible] ⊖[illegible] (35)	[illegible] (36)
91.3	0.72	(38) ⊕[illegible] ⊖[illegible] (39)	[illegible] (40)
50.0	0.66	(42) ⊕[illegible] ⊖[illegible] (43)	[illegible] (44)
80.4	0.69	(46) ⊕[illegible] ⊖[illegible] (47)	[illegible] (48)
65.9	0.67	(50) ⊕[illegible] ⊖[illegible] (51)	[illegible] (52)

11. (C) large volume magnetic tapes, disks; various audio visual educational material
    (E) learning reaction and educational effect judging machine facility, computer, individual learning booth, various simulation systems
    (Sys) education and training data bank, making up curriculum, program making
12. Culture, Leisure Activities
13. Campsites, fishing streams and banks, seashore, hunting grounds, and field athletics facilities are set up and family leisure activities in commune with nature become popular
14. (+) people's awareness, consensus
15. (-) costs, investment, scale

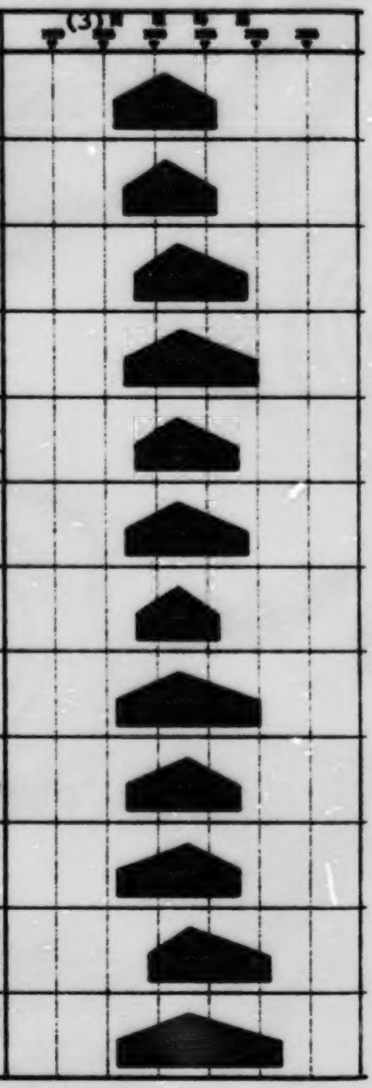
[Key continued on following page]

16. (E) community plant for wash water, waste water treatment and recycling and sewage treatment
    (B) outdoor family leisure facility, motor home site
    (Sys) joint research by psychologists, sports physiologists and others. There are some states in the United States where the available rivers and streams and lakesites per capita is established by law
17. To be sure, past activities such as travel, visits to foreign countries, sightseeing, hot spring visits will continue with longer residence times and will proliferate in more varied and fixed manner
18. (+) people's awareness, consensus
19. (-) costs, investment, scale
20. (B) campsites, pension, tourist homes
    (Sys) domestic and foreign travel, tourist information system
    (Ser) domestic and foreign travel, tourist information service (free)
21. In addition to the dissemination of culture through books, magazines, and records as was the case in the past, video tapes to cover greater areas and offer more variety of information (including stereovision TV) will become important information medium
22. (+) industry and firm efforts
23. (-) costs, investment, scale
24. (C) VTR tapes, disks
    (E) VTR reproducing booth, VTR tape and disk storage facility, video related picture taking, reproducing and regenerating equipment facility
    (B) independent or joint use (for libraries) VTR libraries
    (Ser) video related picture making industry
25. Social clubs will be needed not only for the old and young but on local, occupational, or interest areas to widen interchange between people
26. (+) people's awareness, consensus
27. (-) people's inertia, resistance
28. (E) audio-visual equipment, DIY equipment set, simple entertainment machines, simple sports facilities, simple eating facilities, individual or joint use social clubs
    (Sys) joint research by psychologists, educators, district occupational representatives
29. The Japanese will begin to associate with neighbors and working colleagues of similar tastes and engage in home parties type entertainment which is not too expensive
30. (+) people's awareness, consensus
31. (-) people's inertia, resistance
32. (M) food and drinks for home parties
    (C) sundries for home parties
    (E) equipment and facilities for home parties, interior and exterior, taking home parties into account
    (Ser) catering service for home parties
    This will be one of the basic features of the new urban communities
33. The overcrowding of Japan's urban centers is not something which can be remedied overnight and the cities need to develop and industrialize (includes free or low cost projects of public organizations) leisure services and facilities to enable space and time economy
34. (+) people's awareness, consensus
35. (-) costs, investment, scale

[Key continued on following page]

36. (E) development and improvement of various entertainment machines
(B) entertainment center, sports center, social center, libraries, video libraries, theaters, movie houses
(Sys) psychologist-physiologist research of leisure
37. Leisure facilities where nature directed recreation, people involved activities, and team work fostering activities are offered will be widely used
38. (+) people's awareness, consensus
39. (-) costs, investment, scale
40. (E) community plant for wash water and waste water treatment and recycling and sewage treatment
(B) outdoor training facilities, indoor training facilities, outdoor family leisure facilities, motor home site
(Sys) joint research by psychologists, sports physiologists, and educators
41. People's healthy competitive spirits are fostered through games and sham events to provide catalysis of better health through outdoor games on land that will be developed
42. (+) people's awareness, consensus
43. (-) costs, investment, scale
44. (E) free robot, equipment to make precise measurements of individual's body strength and nerve reflex capabilities, system to provide different sized tools for outdoor work according to individual differences, various outdoor large game machines
(Sys) plants and designs for various sham events, basic and mass type time consuming leisure
45. Individuals or groups research homeland or regional history, society, or culture and the results are recorded and published through the use of facilities that will be set up throughout the country
46. (+) people's awareness, consensus
47. (-) costs, investment, scale
48. (E) booths for access to local data banks, comprehensive communication terminal for instructor, computer
(B) semipublic research rooms (individual or joint use)
(Sys) local information data bank, training and organization of instructors and guides
Making so-called time consuming leisure more high class
49. Development of leisure activity in which people spend 2-3 weeks of their time in summer at sparsely settled areas making charcoal, helping in agriculture and animal husbandry, and helping in general in a living participation type leisure activity
50. (+) people's awareness, consensus
51. (-) costs, investment, scale
52. (E) reproduction of old production machines, repairing present used and old industrial machines for use by individuals
(B) leisure farms for participation in production, production participation type leisure grazing farms, production participation type leisure plants, production museums
(Sys) training and organization of instructors and guides, joint research by psychologists, industrial specialists, and labor physiologists

(1) 番号	課 題 名 (2)
11	ビデオ・テープ（立体視テレビ用を含む）を保存し、貸出したり、再生して見せる施設が、現在の図書館とならんで大きな役割を果たすようになる。 (8)
12	一般教養、趣味、余暇の過ごし方、コミュニティとのかかわりあいなど、目的別、年齢別、地域別、社会教育のソフトウェア（VTRなどを媒体とする教材）作りが、大きな産業になっている。 (12)
13	チームを組んで比較的不便な船をチャーターし、2−3週間程度遠くまで航海し、海上生活をする海上型レクリエーションが普及する。 (16)
14	人間の健全な闘争心や競争心をゲーム、模擬イベントの中で発揮させ、カタルシスをもたらすような機器、施設の開発がつよく望まれる。 (20)
15	質量ともに負荷の大きな精神的、心理的緊張と、筋肉的、肉体的緊張とを結合させるような訓練施設の開発、普及。 (24)
16	複雑な社会環境を模擬する事象をつくり出し、それにたいする判断、処理力を楽しみながら養う、現在のビジネス・ゲームと訓練機器の機能を結合し、高度化した設備が開発され、普及している。 (28)
17	人間の健全な闘争心や競争心をゲーム、模擬イベントの中で発揮させ、カタルシスをもたらすような新種のゲームや装置の開発がつよく望まれる。 (32)
18	動物愛護、食糧問題、公害社会問題などの観点からペット飼育は許可制、資格認定制になっている。 (36)
19	希望者には、文学、音楽、美術、舞台芸術、演劇、その他の芸術の基礎技術を無料もしくは低額に与え、隠されている能力を発見する機会を与える公的サービスと施設の開発がつよく望まれる。 (40)
20	過度に便利化されず、相当の労働を必要とするような長期滞在型余暇施設が全国的に普及する。 (44)
21	人生、社会、自然における多種多様なハプニング、意外性をしめす模擬イベントを発生させ、それにたいする対応能力のテストや訓練を行なうような機器、施設の開発がつよく望まれる。 (48)
22	動物愛護、食糧問題、公害、社会問題などの観点からペットの飼育制限がきめられ、動物へのピル投与、避妊手術等が厳重に励行される。 (52)



Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comment
8. Facilities which keep video tape (including stereo TV) for loan or reproduction will play major roles alongside present libraries
9. (+) organizational role of administration
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) [illegible]・[illegible]	コ メ ン ト (7)
91.5	0.72	(9) ⊕行政の[illegible] ⊖費用・投資の額・規模 (10)	ⓔ立体無人倉庫、コンピュータ、VTR視聴覚ブース。ⓑ[illegible]を考慮した建造物、高度自動化[illegible]。ⓢVTRテープ・ディスク受入れ処理・収納・取出し・情報処理総合システム。最近開館した[illegible]にその部分的なのができた。(11)
70.5	(13) 0.69	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (14)	ⓔ多量の磁気ディスクとテープ、[illegible]。ⓑ[illegible]・[illegible]、コンピュータ、[illegible]ブース、多種シミュレーション・システム。ⓢ教育・学習用データバンク、カリキュラム作成、プログラム作成、教材作成。(15)
62.2	(17) 0.66	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (18)	ⓔ[illegible]・[illegible]・[illegible]、[illegible]シミュレータ、エンジン[illegible]。ⓑ[illegible]。ⓢインストラクターとガイドの養成・組織化、心理学者・[illegible]専門家・[illegible]等の共同研究、作業マニュアルの作成。(19)
41.9	0.64	(21) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (22)	ⓔFRP、[illegible]、[illegible]。ⓑ[illegible]。[illegible]ロボット、個人の体力・神経反射能力を内密に測定する装置、個人差に応じて野外で大道具・小道具を出し入れ移動するシステム、多種多様な野外大型ゲームマシン。ⓢ野外ゲームランドの[illegible]、[illegible]イベントの[illegible]。(23)
55.6	0.66	(25) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (26)	ⓔ心身機能を付加えたビジネス・ゲーム・マシン、コンピュータ。ⓑビジネス・ゲーム・マシン。ⓢ心理学者・生理学者・社会科学者・経済学者・情報工学者などの共同研究、ビジネス・ゲーム用データバンク、ビジネス・ゲームのプログラム開発。(27)
55.6	0.68	(29) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (30)	ⓔ心身機能を付加えたビジネス・ゲーム・マシン、コンピュータ。ⓑビジネス・ゲーム・センター。ⓢ社会科学者・経済学者・社会工学者・心理学者・情報工学者などの共同研究、ビジネス・ゲーム用データバンク、ビジネス・ゲームのプログラム開発。ORの[illegible]、決断力養成ゲームなどはいかが。(31)
45.5	0.66	(33) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (34)	ⓔ[illegible]ロボット、個人の体力・神経反射能力を内密に測定する装置、個人差に応じて野外で大道具・小道具を出し入れ移動するシステム、多種多様な野外大型ゲームマシン。ⓢ心理学者・スポーツ生理学者・その他の共同研究、ビジネス・ゲームの多様化、高度化、複雑化。(35)
46.7	0.61	(37) ⊕行政の[illegible] ⊕国民・住民の認識・コンセンサス (38)	ⓔ飼育ペット用[illegible]。ⓑペット[illegible]センター。ⓢ飼育ペット・データバンク。[illegible]なペット飼育はひとに迷惑をかける。(39)
87.0	(41) 0.70	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (42)	ⓑ半公開[illegible]、半公開小劇場、半公開アトリエ（以上いずれも独立または併設）。ⓢ[illegible]なインストラクターやガイドの養成と組織化。(43)
80.0	(45) 0.68	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (46)	ⓔ古い[illegible]。ⓑ生産参加型レジャー農場、生産参加型レジャー牧場、生産参加型レジャー工場、[illegible]、[illegible]。ⓢインストラクターやガイドの養成・組織化、心理学者・[illegible]専門家・[illegible]等の共同研究。(47)
36.4	0.39	(49) ⊕[illegible]・企業の努力 ⊖費用・投資の額・規模 (50)	ⓔ[illegible]ロボット、個人差に応じて野外で大道具・小道具を出し入れ移動するシステム、コンピュータ、多種多様な野外大型ゲームマシン。ⓢ心理学者・スポーツ生理学者・その他の共同研究、[illegible]イベントの[illegible]。[illegible]、[illegible]の老化防止のため中高年層にもすすめられよう。(51)
39.1	0.37	(53) ⊕行政の[illegible] ⊖国民・住民の[illegible]・[illegible] (54)	ⓔ飼育ペット用[illegible]。ⓑペット[illegible]センター。ⓢ[illegible]の確立と改善。(55)

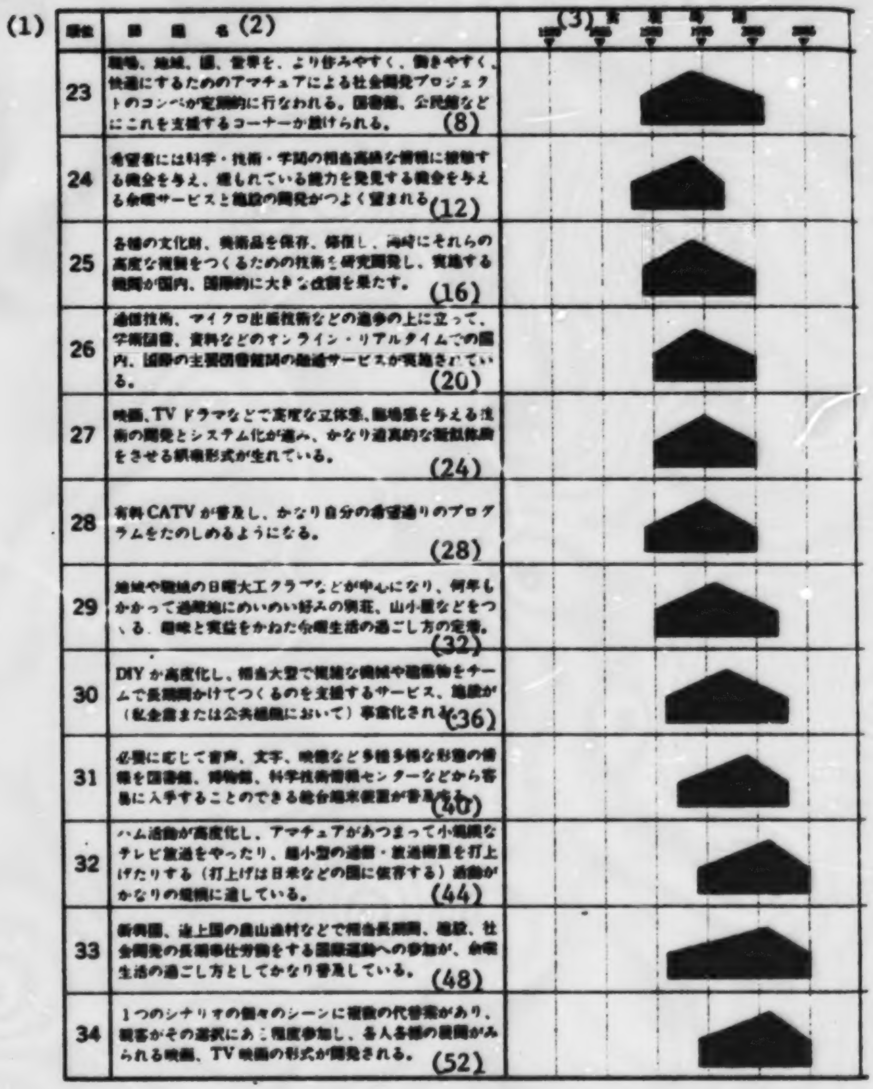
11. (E) stereo unmanned storage, computer, VTR video-audio booth
(B) building protected from external noise by magnetic system, high level automation library facility
(Sys) comprehensive VTR tape disk acceptance, processing, storage, retrieval, and information treatment system
There are some recently built national museums with this capability
12. Preparation of software (educational material using VTR as media) according to problem, age, district, or social education such as on general education, hobbies, leisure activity, and community affairs becomes big business
13. (+) people's awareness, consensus
14. (-) costs, investment, scale

[Key continued on following page]

15. (C) large volume magnetic disks and tapes, various audio-visual educational material
(E) learning reaction and educational effect judging machine facility, computer, individual learning booth, various simulation systems
(Sys) education and training data bank, making of curriculum, making programs, drawing up educational material
16. Seagoing recreation in which some seldom used ship is chartered for 2-3-week cruise to sail quite a distance to provide seagoing experience becomes common
17. (+) people's awareness, consensus
18. (-) costs, investment, scale
19. (E) actual training machinery for navigation, marine products, and loading; navigation simulator engine related training machinery
(B) ship where passengers participate in ship work
(Sys) training and organization of instructors and guides, joint research by psychologists, industrial specialists, labor physiologists, etc., making work manual
20. People's healthy competitive spirits are fostered through games and sham events to catalyze their actions through the development of equipment and facilities
21. (+) industry and firm efforts
22. (-) costs, investment, scale
23. (M) FRP, various foamed buffer material, various synthetic resin material
(C) various synthetic resin products
(E) amusement robot, device to closely measure a person's body strength and nerve reflexes, system by which an individual operates large or small equipment outdoors according to his strength, large game machine for various outdoor games
(B) plans, designs, and construction of outdoor game land, plans and designs for various sham events
24. Development and popular use of leisure facilities for muscle building and body tensile buildup together with spiritual and psychological uplift
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (E) business game machine which includes psychophysiological capabilities, computer
(B) business game center
(Sys) joint research by psychologist, physiologist, social scientist, economist, and information scientist
Data banks for business games, program development for business games
28. Production of events to mimic complex social phenomena, nurture activities which judge and propose countermeasures and provide enjoyment in the process, combine the mechanical capabilities of the present-day game machines, and provide high level leisure activity is a desirable development
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (E) business game machines which include psychophysiological capabilities, computer
(B) business game center
(Sys) joint research by social scientist, economist, social engineer, psychologist and information engineer, data bank for business games, program development for business games, study of OR, games to develop decision making

[Key continued on following page]

32. Project man's competitive nature through participation in games and sham events to catalyze his actions in the games and pleasures that are developed
33. (+) industry and firm efforts
34. (-) costs, investment, scale
35. (E) amusement robot, facility to measure closely a person's body strength and nerve reflexes, movable system placed outdoors in which a person moves large or small equipment according to his capabilities
36. Pet keeping becomes a permissible system and status symbol system from the viewpoints of love of animals, food problem, and frictions of polluted society
37. (+) organizational role of administration
38. (+) people's awareness, consensus
39. (M) contraceptives for household pets
(B) pet protection and management center
(Sys) pet data bank
Irresponsible ownership of pets disturbs other people
40. There is great need for a leisure service and facilities which offer at no cost or very nominal cost basic training in literature, music, arts, drama, entertainment, and other entertainment capabilities to provide the opportunity of unearthing latent talent
41. (+) people's awareness, consensus
42. (-) costs, investment, scale
43. (B) semipublic classrooms, semipublic small theater, semipublic atria (the above all are for individual or joint use)
(Sys) high level instructor and guide training and organization
44. Long term resident type leisure facilities with the minimum of conveniences and requiring considerable labor become popular all over the country
45. (+) people's awareness, consensus
46. (-) costs, investment, scale
47. (E) old industrial equipment
(B) production participation type farm, production participation type leisure animal farm, production participation type leisure plant, sailing participation type ship, production antique museum
(Sys) training and organization of instructors and guides, joint research by psychologists, production specialists, and labor physiologists
48. There is need for equipment and facilities to test and train man to be able to cope with any type of happenings which befall man, society, and nature
49. (+) industry and firm efforts
50. (-) costs, investment, scale
51. (E) amusement robot, movable system for outdoor use where a person can operate large or small equipment according to his capability
(Sys) joint research by psychologists, sports physiologists, and others, plans and designs of various sham events
Promoted in middle and aged to prevent mental and nervous deterioration
52. The number of pets which can be kept will be limited because of love for animals, feed problem, pollution, and social friction, and the use of pills for contraceptive used on animals becomes highly promoted
53. (+) organizational role of administration
54. (-) people's inertia, resistance
55. (M) contraceptive for household pets
(B) pet protection and management center
(Sys) establishment and improvement of system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Key:

1. No.
2. Subject
3. Materialization period
4. Desirability
5. Materialization probability
6. Promoting, suppressing conditions
7. Comments
8. Amateur attempts to make occupations, regions, countries, and the world a better place to live, work, and enjoy will be attempted as social projects for periodic comparison. A corner will be set aside in libraries and public halls to support such service
9. (+) people's awareness, consensus
10. (-) costs, investment, scale

(4) [illegible] (%)	(5) [illegible]	(6) 促進・抑制条件	コ メ ン ト (7)
78.3	(9) 0.66	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (10)	Ⓔ社会開発データバンクのアクセスマシン（専用端末）つきブース、インストラクターとの総合通信端末。Ⓑ半公開の研究室（独立または併設）。Ⓢ社会開発情報データバンク、インストラクターやガイドの養成・組織化。 (11)
85.4	(13) 0.70	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (14)	Ⓔ科学・技術情報データバンクのアクセスマシンつきブース。Ⓢ高度なインストラクターやガイドの養成と組織化。科学・技術情報データバンク（対話型で通用できるシステム）。時間消費型レジャーの最も高級なもの。 (15)
86.7	0.69	(17) ⊕行政の積極的援助 ⊖費用・投資の額・規模 (18)	Ⓗ[illegible]・飼料・器具、顕微鏡、合成装置。ⒺX線・超音波等検査機器、分光分析等試験機器、高性能[illegible]機器。Ⓑ文化財等企業共同研究所（独立または併設）。Ⓢ文化財保護法制の確立・充実。 (19)
93.6	0.69	(21) ⊕行政の積極的援助 ⊖費用・投資の額・規模 (22)	Ⓗ超高解像度感光材。Ⓔ超高解像度レンズ。Ⓔ超マイクロ写真撮影機・複写機器、超高速PCM通信機器。Ⓢ衛星通信システム、超マイクロ出版システム、超高密度記録・PCM通信システム。マイクロ化、超マイクロ化により、記憶媒体の容積が100分の1、1000分の1ですむようになる。 (23)
65.2	0.67	(25) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (26)	Ⓔ鑑賞ブース（振動、香り、[illegible]加速度、光、立体音響等発生装置のついた）、ホログラム等による立体映像・TV放映装置。Ⓑ[illegible]（TV）劇場（ブース・セル方式）。Ⓢ心理学者・情報工学者・電子工学者・映像プロデューサー等の共同研究。立体音響、立体映像TVは大きな魅力をもつだろう。 (27)
71.1	0.67	(29) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (30)	Ⓗ光通信ケーブル。Ⓔ有料CATV用コインメカニズム、超多チャンネルTV受信機。Ⓢ超多チャンネルCATVシステム。 (31)
37.8	(33) 0.37	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (34)	Ⓔ素人用建設機械、素人用[illegible]機械、素人用運搬機械。Ⓢマニュアル、同好クラブ組織の広域化、インストラクション・ブックやガイドブック、インストラクターやガイドの養成・組織、部品・部材・設備機器のオープン化、制度（形式承認など）の確立・整備。 (35)
47.6	(37) 0.60	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (38)	Ⓗ建築材料・建材（小口販売）。Ⓔ素人用工作機械、素人用建設機械、素人用[illegible]機械。Ⓑインストラクション・センター。Ⓢマニュアル、インストラクション・ブックやガイドブック、インストラクターとガイドの養成・組織、部品・部材・設備機器のオープン化、制度（形式承認など）の確立・整備。 (39)
83.0	0.65	(41) ⊕[illegible]の努力 ⊖費用・投資の額・規模 (42)	Ⓔ音声入力検索端末、キーコード入力検索端末、音声出力端末、映像出力端末、ハードコピー装置（ファクシミリ等）、通信制御装置、総合通信交換機。Ⓢ広域多モード情報検索システム（カタログ・シソーラス）、広域多モード情報データバンク・システム、広域総合通信システム。 (43)
27.3	0.35	(45) ⊕産業・企業の努力 ⊖費用・投資の額・規模 (46)	Ⓗ各種アンテナ。Ⓔ超小出力TV放送機キット、超小出力衛星通信・放送機キット。Ⓢ制度の確立・整備、アマチュア間の良好な慣習、政府との[illegible]関係の確立。 (47)
45.5	(49) 0.38	⊕国民・住民の認識・コンセンサス ⊖費用・投資の額・規模 (50)	Ⓔキャンピング・カー、モービル・ホーム、超小型コミュニティ・プラント（上下水道、し尿処理など）、小型パワープラント、[illegible]、医療キット等。Ⓑキャンプ・サイト。Ⓢ[illegible]な制度と情報網の確立と整備。長期余暇とボランティア活動の結合は、地味だが着実な伸びをしめすだろう。 (51)
33.3	0.35	(53) ⊕[illegible]の努力 ⊖費用・投資の額・規模 (54)	Ⓔ鑑賞ブース（キーコードセレクタ、音響装置、[illegible]映像装置等のついた）。Ⓑマルチ・セル・ブース式劇場。Ⓢ作家・脚本家・[illegible]・演出家・心理学者等の共同研究。 (55)

11. (E) access machines to social development data banks (special use terminal) provided booths, total communication terminal with instructor
    (B) semipublic research rooms (individual or joint facility)
    (Sys) social development information data bank, training and organization of instructors and guides
12. Aspiring people will be given opportunity to come in contact with comparatively high level science, technology, or other academic areas to give opportunity for latent talent to reveal itself in a desirable leisure activity development
13. (+) people's awareness, consensus
14. (-) costs, investment, scale

[Key continued on following page]

15. (E) booths provided with access machines to science and technology information data banks
(Sys) training and organization of high level instructors and guides, science and technology information data bank (system which can be activated by conversational mode)
Most high class form of time consuming leisure
16. An organ to preserve, repair, and make high class reproductions of various cultural and art treasures will play important national and international roles
17. (+) organizational role of administration
18. (-) costs, investment, scale
19. (M) cosmetics, paints, pigments, adhesives, synthetic resins
(E) X-ray and ultrasonic detectors, spectroscopic test equipment, high level space modulation environment producing equipment
(B) cultural goods repair facility (individual or joint facility)
(Sys) establishment and provision of cultural goods preservation system
20. Taking advantage of advances in communication technology and microprinting technology, academic works and materials will be made available between the main libraries of the country by on-line real time service that will become common
21. (+) organizational role of administration
22. (-) costs, investment, scale
23. (M) super high resolution light sensitive material
(C) super high resolution image lens
(E) super microphoto camera, copier, super high speed PCM communication equipment
(Sys) satellite communication system, super microprinting system, super high density picture and PCM communication system
By using micro or super micro equipment, the contents of libraries can be reduced by 1/100 or 1/1000 of the present scale
24. Development and systematization of technology to impart high level 3-dimensional realism to movies and drama will be promoted and a form of entertainment of considerable realism by sham experience will be created
25. (+) industry and firm efforts
26. (-) costs, investment, scale
27. (E) viewing booth (with vibration, impact, sham acceleration, light, and stereo sound effects), stereo movie and TV broadcast facility using holography
(B) super realistic movie (TV) theater (booth cell type)
(Sys) joint research by psychologist, information scientist, electronic engineer, and entertainment producer
Stereo sound and stereo movies and TV will probably wield considerable power
28. Pay CATV becomes popular, and programs much to one's desires become available
29. (+) industry and firm efforts
30. (-) costs, investment, scale
31. (C) optical communication cable
(E) coin mechanism for pay CATV, super multichannel TV receiver
(Sys) super multichannel CATV system
32. Local and occupational Sunday do-it-yourself projectsters will be the nucleus of the construction of villas and mountain shacks in sparsely settled areas in a form of leisure combining interest and profit

[Key continued on following page]

33. (+) people's awareness, consensus
34. (-) costs, investment, scale
35. (E) individual construction machines, individual scaffolds, individual transport machines
(Sys) manual, similar interest clubs become widespread, instruction books and guide books, training and organization of instructors and guides, open access to parts, materials, and installed machines, establishment and provision of system (for shape recognition)
36. DIY becomes high level and a service which gives long term support to team construction of comparatively large and complex machines and structures (through private industry or public organization support) will become industrialized
37. (+) people's awareness, consensus
38. (-) costs, investment, scale
39. (M) machine parts and materials (low cost retail outlets)
(E) individual fabrication machinery, individual construction machinery, individual scaffolding
(B) instruction center
(Sys) manual, instruction book and guide book training and organization of instructors and guides, open access to parts, materials, and facilities equipment, establishment and provision of system (for shape recognition)
40. A comprehensive terminal facility which makes readily available when desired voice, written, or pictorial items of all types at libraries, museums, and science and technology information centers will become popular
41. (+) research and development establishment efforts
42. (-) costs, investment, scale
43. (E) voice input search terminal, key code input search terminal, voice output terminal, image output terminal, hard copy facility (facsimiles, etc.), communication control facility, comprehensive communication exchange
(Sys) wide area multiple mode information search system, (catalog, thesaurus), wide area, multimode information data bank system, wide area comprehensive communication system
44. Ham activities attain high levels, amateurs will get together to conduct small scale TV broadcasts or launch very small communication and broadcast satellite (launching will be aided by the nation), and this type of activity will assume considerable size
45. (+) industry and firm efforts
46. (-) costs, investment, scale
47. (C) various antenna
(E) super small output TV broadcast kit, super small output satellite communication and broadcast kit
(Sys) establishment and provision of system, desirable practices between amateurs, establishment of privileged communication with government
48. Participation in international movements to provide long term labor to enable construction and social development of farming and fishing villages in emerging and developing countries as one means of spending one's leisure will become commonplace
49. (+) people's awareness, consensus
50. (-) costs, investment, scale

[Key continued on following page]

51. (E) camping car, mobile home, super small community plant (with water and toilet facilities), small power plant, construction machines, medical kits
(B) camp site
(Sys) establishment and provision of international system and trust relationships
The coupling of long term leisure and volunteer activities is a fertile idea and may proliferate
52. A movie and TV style will be developed in a single scenario through a number of substitute scenes, and patrons are allowed to participate in a limited extent on the selection of the final form to enable individual and various developments
53. (+) research and development establishment efforts
54. (-) costs, investment, scale
55. (E) viewing booth (with key code selector, sound equipment, individual projector)
(B) multicell booth type theater
(Sys) joint research by composer, playwright, critic, producer, psychologist, etc.

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META SYSTEM TECHNOLOGY—221 SELECTIONS

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 149-189

[Text] As noted on page 21, this present survey established a third panel in addition to the first and second panels.

This third panel enlisted the participation of 630 people who are in leadership roles of national research organs and industry's research and developments phase acquainted with the 12 subjects of resources, forestry and marine products, metals, electrical materials, organic and polymeric material, machines, electrical energy, electronics, information, communication, transport, traffic, construction engineering, waste disposal, recycle, and medicine and health. They were asked to present their views on the technology they expect to see developed, the expected time these developments were expected to materialize, any restricting conditions, and the organs doing the developing and the fiscal outlays required.

These compiled results were then divided into nine regional classifications, and the following meta system technology is the result. The term meta system technology is used here for the following reasons.

The respondents of this third panel are first line researchers and are engaged in nonsystems technology in the form of element technology and individual technology where they make specific decisions. On the other hand, there are some facets of their work which are comparatively systematized, and technology with accumulated and compiled functions are included.

In this manner, these people have element technology and individual technology status yet still retain some system technology status as well, and it was decided to term this situation meta system technology.

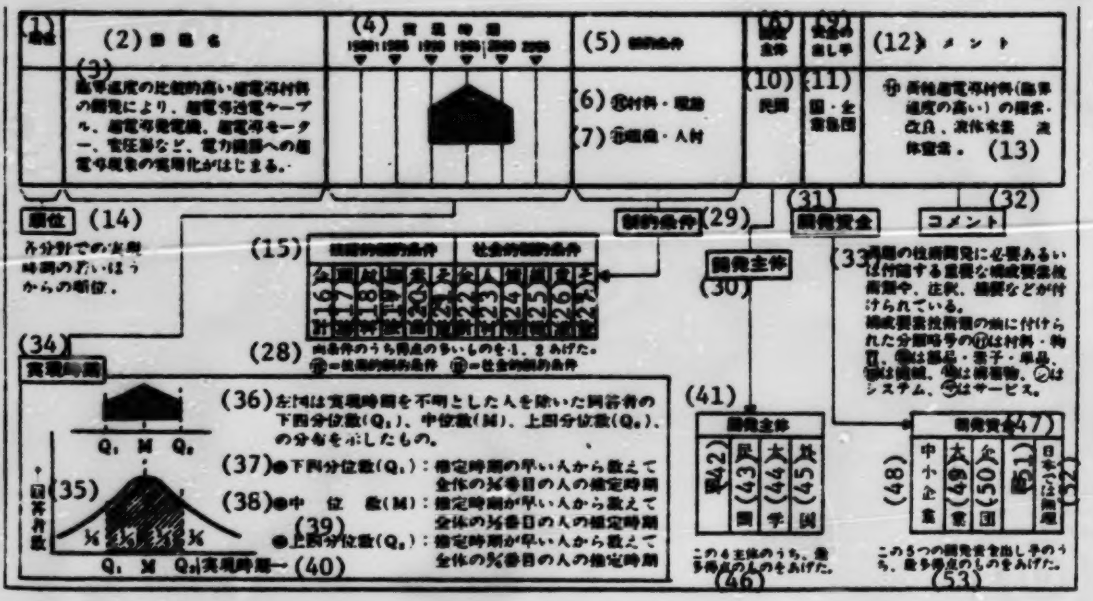
In the preceding system technology prediction, the plans of industrial and development leaders were obtained by questionnaire on what they thought the future would be with regard to the type of system technology that will be industrialized, when they would materialize, would society be in trouble should the development not materialize, and other factors as seen from social needs. This compilation on meta technology is concerned with seeds technology (seed, nuclei serving technology), and this is where this survey differs from the other survey.

When the materialization periods of the same subjects were compared, some interesting results were seen. Although the materialization periods of the two sets were generally in agreement, there were some subtle differences, and differences appeared in the dealing out and accepting of technology (the latter being the side which receives technology, commercializes it, and puts the product on the market).

The materialization periods of the technological items were arrayed by each technology area (subarea when this subclassification was made) and arranged in the order of the expected materialization period. At the same time, there are the answers to questions such as are there any limiting conditions both technologically and socially which might restrict this materialization, who should be the main body of the development, and where should the necessary capital come from. Only those answers which were supported by a fairly substantial number were listed.

The final comment column lists those element technology making up the technology item listed in the extreme left column which are necessary or required, what type of element technology will appear, and what impact their appearances will have.

Guide to Following the Tables on the Following Pages



Key:

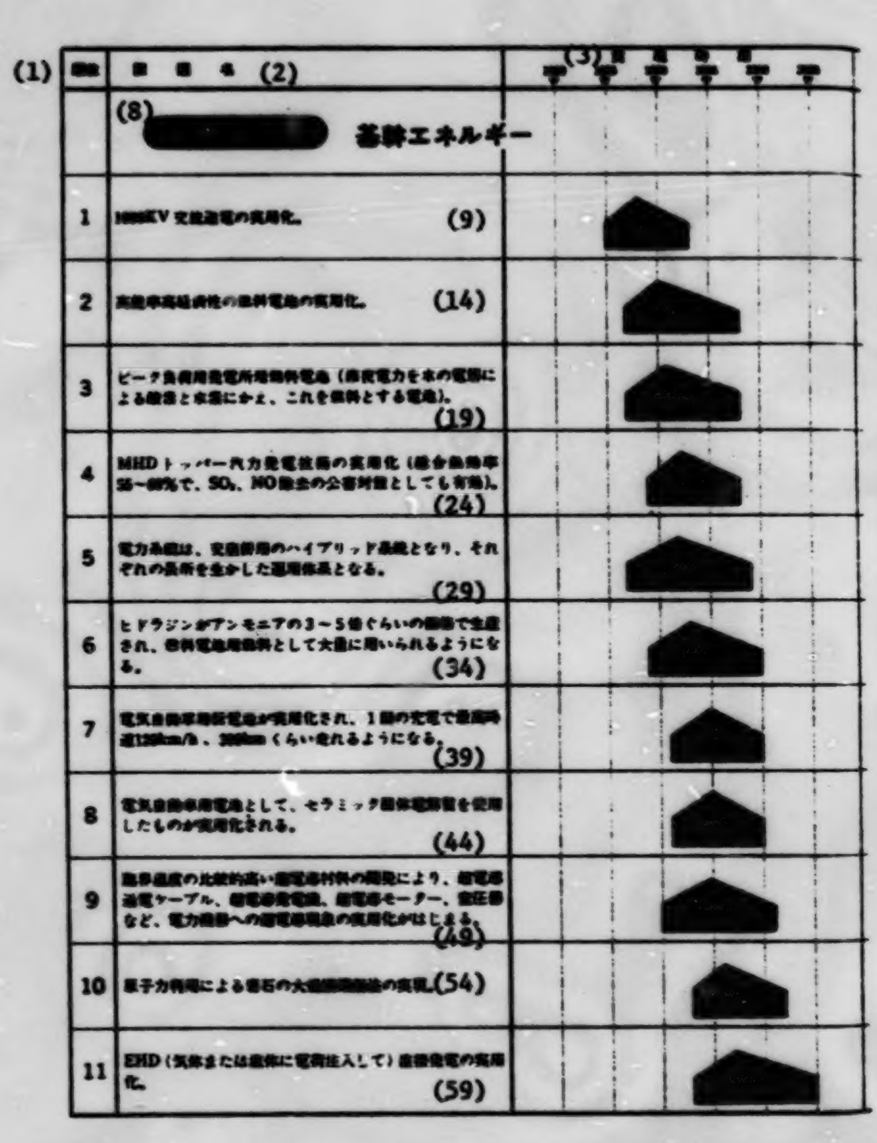
1. Number
2. Subject
3. Development of superconducting material with comparatively high critical temperature for superconducting transmission cables, superconducting generator, superconducting motor and transformer, etc. as practical use of superconductivity in power generation begins
4. Materialization period
5. Restricting conditions
6. (T) materials, theory
7. (S) organization, manpower

[Key continued on following page]

8. Main development organ
9. Main funding body
10. Private
11. Government, company groups
12. Comment
13. (M) search and improvement of new superconducting material (with high critical temperature), liquid hydrogen, liquid nitrogen
14. [Rank] arranged in order of early materialization among the different areas
15. Technology restricting conditions, social restricting conditions
16. Total
17. Theory
18. Materials
19. Fabrication method
20. Components
21. Other
22. Total
23. Manpower
24. Information
25. Organization
26. Awareness
27. Other
28. One or two items among the conditions with most responses were cited
    (T) = technology restricting conditions
    (S) = social restricting conditions
29. Restricting conditions
30. Main developing body
31. Development funds
32. Comment
33. Important component technology necessary or advantageous to technological development of main subject along with notes and explanations and comments are included
    The (M) placed at the head of an element technology denotes material
    (C) = parts, component, unit
    (E) = machine, equipment
    (B) = buildings, structures
    (Sys) = system
    (Ser) = service
34. Materialization period
35. Number of answers
36. The left figure shows the distribution of answers excluding the uncertain ones according to the lower quartile (Q_1), median (M), and upper quartile (Q_2)
37. Lower quartile (Q_1): estimated time given by 1/4 of the total number counting from the earliest anticipated materialization period
38. Median number (M): estimated materialization time given by 1/2 the total answers counting from the earliest anticipated materialization period
39. Upper quartile (Q_2): estimated time given by 3/4 that total number counting from the earliest anticipated materialization period
40. Materialization period
41. Main developing body
42. Government

[Key continued on following page]

43. Private
44. Universities
45. Foreign
46. The one with the maximum number of points from these four is listed
47. Development funds
48. Small and medium firms
49. Large firms
50. Company groups
51. Government
52. Too much for Japan
53. The one with maximum number of points from these five is listed



(1)	(2)	(3)
	(8) 基幹エネルギー	
1	[illegible] (9)	
2	[illegible] (14)	
3	[illegible] (19)	
4	[illegible] (24)	
5	[illegible] (29)	
6	[illegible] (34)	
7	[illegible] (39)	
8	[illegible] (44)	
9	[illegible] (49)	
10	[illegible] (54)	
11	[illegible] (59)	

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting condition
5. Main developing body
6. Source of funding
7. Comment
8. Energy, Basic Energy
9. Practical 1,000 KV AC transmission
10. (T) materials, components
    (S) organization
11. Private
12. Company group

(4) [illegible]	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
(10) [illegible]	(11) [illegible]	(12) [illegible]	(13) [illegible]
(15) [illegible]	(16) [illegible]	(17) [illegible]	(18) [illegible]
(20) [illegible]	(21) [illegible]	(22) [illegible]	(23) [illegible]
(25) [illegible]	(26) [illegible]	(27) [illegible]	(28) [illegible]
(30) [illegible]	(31) [illegible]	(32) [illegible]	(33) [illegible]
(35) [illegible]	(36) [illegible]	(37) [illegible]	(38) [illegible]
(40) [illegible]	(41) [illegible]	(42) [illegible]	(43) [illegible]
(45) [illegible]	(46) [illegible]	(47) [illegible]	(48) [illegible]
(50) [illegible]	(51) [illegible]	(52) [illegible]	(53) [illegible]
(55) [illegible]	(56) [illegible]	(57) [illegible]	[illegible] (58)
(60) [illegible]	(61) [illegible]	(62) [illegible]	(63) [illegible]

13. (M) heat resistant alloy wire for cable use, weather resistant high tensile strength steel for tower construction
    (C) high performance insulators
14. Practical high efficiency and high economy fuel cells
15. (T) material, components
    (S) organization
16. Private
17. Large firms
18. (M) fuel oxidation-reduction catalyst (noble metal, activated carbon, etc.)
    Because it is not polluting, power plants can be sited in cities
19. Fuel cell for peak load power generation (power at late night is used to generate hydrogen and oxygen which are used as fuel for the fuel cells)

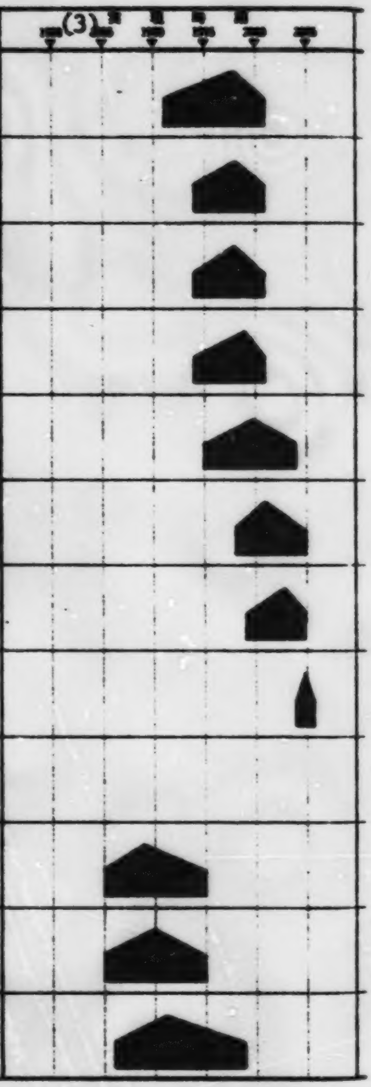
[Key continued on following page]

20. (T) materials, components
    (S) organization
21. Private
22. Large firms, government
23. (M) electrolyte solution (phosphoric acid, sulfuric acid, caustic potash solution, or solid electrolyte conducting oxygen ions), improved catalyst
    (C) porous electrode
    (E) inverter, natural gas reformer
    Easy to site in city, plant, or industrial park
24. Practical development of MHD topper steam power technology (overall thermal efficiency of 55-60% and effective measure against SO_2, NO_x pollution)
25. (T) materials, components
    (S) organization
26. Government, private
27. Government
28. (M) super high temperature electrode material, super high temperature electrically insulating material, super high temperature alloy
    (E) superconducting magnet, inverter, computer, automated control system, high performance cooler
    (B) power plant
29. Power system will be DC-AC hybrid system exploiting the advantages of each
30. (T) theory, components
    (S) organization, awareness
31. Government, private
32. Company group
33. (C) superhigh voltage DC cable, superhigh voltage AC cable
    (E) high performance thyrister, transformer
    The power transmission lines covering the Japanese Archipelago probably will be of the hybrid type
34. Hydrazine will be produced at a cost 3-5 times that of ammonia and used in great quantity in fuel cells
35. (T) material, fabrication methods
    (S) organization
36. Private
37. Large firms
38. (M) catalyst
    (E) development and improvement of hydrogen production reaction tower.
    This is possible should a chemical industry for producing hydrazine be developed
39. Battery for electric automobile will be developed in which speed of 120 km/h and distance of 300 km can be traversed on a single charge
40. (T) materials
    (S) organization, awareness
41. Private
42. Large firms
43. (M) search and improvement for suitable electrolyte, search and improvement for suitable electrode material
    (E) development and practical use of high performance charging mode
44. Automobile batteries using ceramic solid electrolyte will become practical
45. (T) materials, components
    (S) awareness

[Key continued on following page]

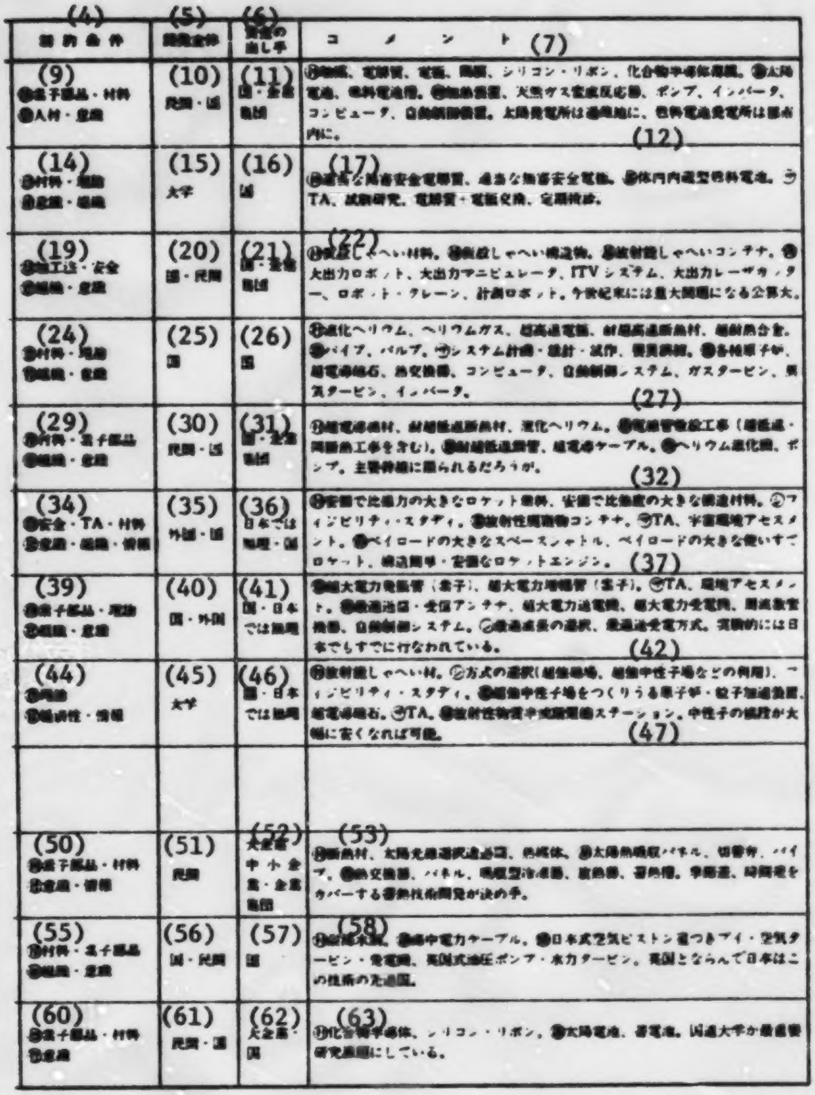
46. Private
47. Large firms, company groups, government
48. (M) search and improvement for suitable solid electrolyte, search, improvement and practical use of suitable electrode material
49. Development of superconducting material with comparatively high critical temperature will be followed by its use in superconducting transmission cables, superconducting generator, superconducting motor, and transformer to lead the way to the use of superconducting phenomenon in power equipment
50. (T) materials, theory
    (S) organization, manpower
51. Private
52. Government, company groups
53. (M) new superconducting material (high critical temperature) search, and improvement, liquid hydrogen, liquid nitrogen
    All heavy electrical equipment will be miniaturized
54. Use of atomic energy for large scale excavation of rock
55. (T) safe environment
    (S) awareness
56. Government
57. Government
58. (C) radioactivity measuring instruments
    (Sys) directional nuclear blast system
    (E) excavation machine (boring), nuclear explosive device, communication system, computer, unmanned construction machinery, robot
    (Ser) assessment, geologic survey, TA (technical assessment = technological evaluation)
    Coal, tar sand development and construction of canals are suited for this application
59. Direct power generation by EHD (charge injection into gas or liquid) becomes practical
60. (T) theory, material
    (S) manpower, awareness
61. Government, universities
62. Government
63. (M) charge donor material, heat resistant electrode, heat resistant construction material, thermal insulating material
    (E) combustor, pump, charge donor material recovery facility, strong magnet, inverter

(1) [illegible]	課 題 名 (2)	(3)
12	燃料電池発電所、太陽電池発電所等、無公害発電所の実用化。 (8)	
13	血液内の酸素と糖質分による反応を燃料電池とする人工臓器（心臓ペースメーカーなど）電源用血液電池の実用化。 (13)	
14	低効率、老朽化原子力発電所の取りこわし技術の実用化。 (18)	
15	MHDトッパー原子力発電技術の実用化(高温ガス炉、新型転換炉、あるいは高速増殖炉とMHDとの組合せにより、総合熱効率55%程度)。 (23)	
16	電力輸送の50%は超電導ケーブルを用いて行なわれるようになる。 (28)	
17	放射性廃棄物の宇宙空間への投棄技術が実用化される。 (33)	
18	電磁波による大電力送電技術の実用化。 (38)	
19	放射性物質の半減期の制御の実用化。 (43)	
	(48) 代替エネルギー	
1	太陽エネルギー利用装置を用いた家庭用空調システムの実用化。 (49)	
2	波力利用発電の実用化（沿岸僻地用として）。 (54)	
3	太陽電池が蓄電池と組合されて、未開発地域、開発途上国でさかんに利用されるようになる。 (59)	



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funds
7. Comment
8. Fuel cell power plant, solar cell power plant, practical nonpolluting power plants
9. (T) components, material
   (S) manpower, awareness
10. Private, government
11. Government, company groups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12. (M) catalyst, electrolyte, electrode, barrier film, silicon ribbon, chemical compound semiconductor film
    (C) solar cell, fuel cell tank
    (E) heater, natural gas denaturation reactor, pump, inverter, computer, automated control device
    Solar cell for use in sparsely settled regions and fuel cell power plants in cities
13. Practical development of blood battery for power source supplying power to artificial hearts (such as pacemaker) using fuel cell operating on reaction between blood oxygen and nutrients in blood
14. (T) materials, theory
    (S) awareness, organization
15. University
16. Government

[Key continued on following page]

17. (M) suitable nonpolluting and safe electrolyte, suitable nonpolluting and safe electrode
(C) fuel cell enclosed in body
(Ser) TA, test research, electrolyte and electrode exchange, periodic diagnosis
18. Development of technology to dismantle low efficiency aged nuclear power plants
19. (T) fabrication method, safety
(S) organization, awareness
20. Government, private
21. Government, company groups
22. (M) temporary shielding material
(B) temporary shield structure
(C) radiation shield container
(E) large output robot, large output manipulator, ITV system, large output laser cutter, robot crane, measurement robot
This is widely expected to be a major problem at the end of this century.
23. Practical development of MHD topper nuclear power generation technology (high temperature gas reactor, advanced converter reactor, or fast breeder reactor combined with MHD to provide overall thermal efficiency of about 55 percent)
24. (T) materials, theory
(S) organization, awareness
25. Government
26. Government
27. (M) liquid helium, helium gas, super high temperature electrode, super high temperature resistant thermal insulator, super high temperature resistant alloy
(C) pipe, valves
(Ser) system plan, design, test production, personnel training
(E) various nuclear reactors, superconducting magnets, heat exchanger, computer, automated control system, gas turbine, steam turbine, inverter
28. Power transmission will be at least 50 percent by superconducting cables
29. (T) materials, theory
(S) organization, awareness
30. Private
31. Government, company groups
32. (M) superconducting wire, low temperature resistant insulator, liquid helium
(B) electric conduit installation project (including superlow temperature insulating project)
(C) superlow temperature resistant pipe, superconducting cable
(E) helium liquefier, pump
May be limited to main trunk lines
33. Space disposal of radioactive wastes becomes practical
34. (T) safety, TA, materials
(S) awareness, organization, information
35. Foreign, government
36. Too much for Japan, government

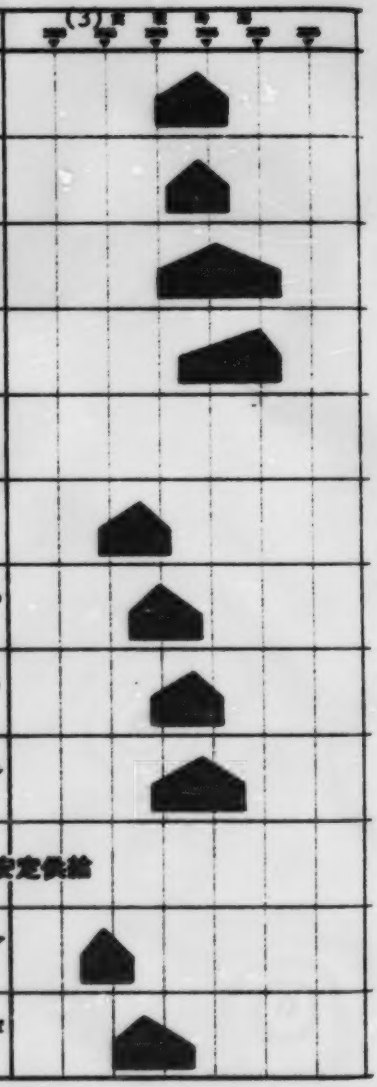
[Key continued on following page]

37. (M) rocket fuel of low cost and large specific thrust, cheap and large specific strength construction material
(Sys) feasibility study
(C) radioactive waste container
(Ser) TA, space environmental assessment
(E) space shuttle with large payload, large payload and readily usable rocket, simple construction and low cost rocket
38. Practical use of large power transmission by electromagnetic waves
39. (T) components, theory
(S) organization, awareness
40. Government, foreign government
41. Government, too much for Japan
42. (C) superlarge power oscillator (element), superlarge power amplifier (element)
(Ser) TA, environmental assessment
(E) optimum communication and reception antenna, superlarge power transmitter, superlarge power receiver, frequency modulator, automated control system
(Sys) selection of optimum wavelength, optimum transmission and reception mode
This is being done experimentally even in Japan
43. Practical control of half-lives of radioactive materials
44. (T) theory
(S) economics, information
45. University
46. Government, too much for Japan
47. (M) radiation shielding material
(Sys) mode selection (superstrong field, use of superstrong neutron field) feasibility study
(E) nuclear reactor and particle accelerator to create superstrong neutron field, superconducting magnet
(Ser) TA
(B) station to reduce half-lives of radioactive materials
Possible if large reduction in cost of neutrons is achieved.
48. Substitute Energy
49. Practical house air conditioning system utilizing solar energy
50. (T) materials, components
(S) organization, awareness
51. Private
52. Large firms, small, medium firms, company groups
53. (M) thermal insulator, selective solar rays transmitting film, thermal medium
(C) solar energy absorbing panel, cutover valve, pipe
(E) heat exchanger, panel, absorption cooler, heater, heat storage tank
Development of heat storage technology to cover seasonal and time differences will be deciding issue
54. Practical wave powered power plant (for coastal use)
55. (T) materials, components
(S) organization, awareness
56. Government, private
57. Government

[Key continued on following page]

58. (M) seawater resistant steel
    (C) undersea power cable
    (E) Japanese-type air piston attached buoy-air turbine generator
    English-type hydraulic pump water powered turbine
    Japan lines up with Great Britain as leaders in this technology
59. Solar cells and storage batteries are widely used in combination to provide power in undeveloped regions and developing countries
60. (T) components, materials
    (S) awareness
61. Private, government
62. Large firms, government
63. (M) compound semiconductor, silicon ribbon
    (C) solar cell, storage battery. UN University plans to make this a most important research subject

(1) [illegible]	課　題　名　(2)
4	潮流誘導方式による潮汐発電の実用化。 (8)
5	石炭液化による燃料油の製造の工業化（注：採掘可能な世界の燃料資源は石炭88%、石油3%、油母頁岩6%、天然ガス3%）。 (13)
6	太陽電池を各家庭で利用するようになる。 (18)
7	太陽電池の大電力化が実現する（とくに砂漠部を利用して）。 (23)
	(28) 省エネルギー
1	大都市、中都市で汚泥焼却発電の実用化。 (29)
2	プラズマ・ジェットによる化学反応（石油、石炭などの炭化水素の分解など）の実用化。 (34)
3	爆発反応のエネルギーが他の化学反応に利用されるようになる。 (39)
4	低温排熱（80℃以下）の工業的利用技術、およびエネルギー転換技術の実用化。 (44)
	(49) 主食穀物の安定供給
1	窒素・リン酸・カリ質肥料の肥効発現の人為的調節（マイクロカプセル化など）が実施される。 (50)
2	特定の昆虫（害虫）に特異的に有効（殺虫、不妊化、変態阻止）な農薬の実用化。 (55)



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funds
7. Comment
8. Practical development of tide generated power using the tide flow induction mode
9. (T) materials, fabrication method
   (S) organization, awareness
10. Government, private
11. Government

(4) 制約条件	(5) 開発主体	(6) 資金の出し手	コメント (7)
(9) [illegible]材料・加工法 [illegible]・金融	(10) 国・民間	(11) 国	(12) [illegible]耐海水鋼、耐海水コンクリート、耐海水モルタル。[illegible]適合建設地点の調査研究。[illegible]チューブ・タービン、発電機。[illegible]潮流誘導土木工事。大隅海峡、種子島近辺などは大発電所の好適地といわれる。
(14) [illegible]加工法・理論・材料 [illegible]人材・情報・組織	(15) 国・民間	(16) 国・企業集団	(17) [illegible]触媒、水素。[illegible]連続供給装置、高温ガス原子炉、ガス化炉（クラスター炉など）、加圧水添液化ガス化装置。米（エクソンなど）、日はじめ世界の有力企業が積極的にとりくんでいる。
(19) [illegible]電子部品・材料 [illegible]・人材	(20) 民間	(21) 大企業・企業集団	(22) [illegible]シリコン・リボン、化合物半導体リボン。[illegible]太陽電池取付工事。[illegible]太陽電池。[illegible]インバータ。1kW10万円台になれば爆発的に普及しよう。
(24) [illegible]材料・電子部品 [illegible]・[illegible]	(25) 民間・国	(26) 国・企業集団	[illegible]シリコン・リボン、化合物半導体リボン、電極、選択透光膜材。[illegible]システム・エンジニアリング。[illegible]太陽電池、選択透光膜、地中電力ケーブル。[illegible]TA、環境アセスメント。[illegible]巨大島作いかだ、透光膜処理装置、[illegible]で、アルミ精錬の電源などに向く。(27)
(30) [illegible]材料・研究 [illegible]組織・金融	(31) 民間・国	(32) 大企業・国	(33) [illegible]、[illegible]。[illegible]装置、ボイラ、タービン、発電機。[illegible]一般電力系統への組込み方式。西独や北欧では普及している。日本でも大阪、東京などで検討されている。
(35) [illegible]材料・理論 [illegible]組織・情報	(36) 民間・大学	(37) 大企業	(38) [illegible]触媒装置、反応塔。公害資源研（日）、内務省鉱山局（米）などで開発中。とくに石炭から、エチレン、アセチレンなどが直接生産できる。
(40) [illegible]材料・理論・加工法 [illegible]	(41) 大学・民間	(42) 大企業・企業集団	(43) [illegible]超高温材料の開発・改良。[illegible]超高温発生装置。[illegible]超高温エネルギーによる化学反応装置。ダイヤモンド、ファインセラミックスなど人造鉱物の単結晶製造などに好適。
(45) [illegible]電子部品・材料 [illegible]・[illegible]	(46) 民間・国	(47) 国・大企業	(48) [illegible]ヒートパイプ。[illegible]ヒートポンプ、熱交換器、コンプレッサ、吸収式冷凍機、蓄熱槽、沸騰点のごく低い熱媒体を使うタービンなど。
(51) [illegible]加工法 [illegible]組織・金融	(52) 民間	(53) 大企業	(54) [illegible]マイクロカプセルの材質選択、肥料、包装材。[illegible]マイクロカプセル連続製造、計量包装機械。[illegible]肥料設計。作付けから収穫まで1回の施肥で間に合う。農薬も含めることが容易。
(56) [illegible]材料 [illegible]情報	(57) 国・民間	(58) 大企業	(59) [illegible]天敵農薬、性フェロモン等の誘引剤、変態阻止ホルモン、放射線等で不妊処理した雄昆虫等。

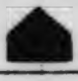
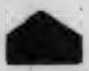
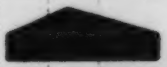
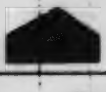
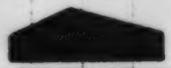
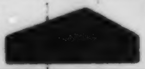
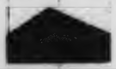
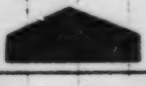
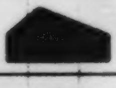
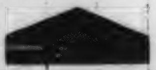
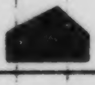
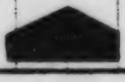
12. (M) seawater resistant steel, seawater resistant concrete, seawater resistant mortar
    (Ser) survey research on suitable construction sites
    (E) tube turbine, generator
    (B) tide flow guiding engineering project
    Osumi Strait, and vicinity of Tanegashima are said to be suitable sites for large power plants
13. Industrialization of production of fuel oil by liquefaction of coal (Note: the available fuel reserves in the world are 88 percent coal, 3 percent oil, 6 percent oil shale, and 3 percent natural gas)
14. (T) fabrication method, theory, materials
    (S) manpower, information, organization
15. Government, private
16. Government, company groups

[Key continued on following page]

17. (M) catalyst, hydrogen
    (E) pulverizing facility, high temperature gas nuclear reactor, gasification reactor (such as cluster reactors), pressurized water injection fluidized gasifier
    Development is under way in the United States (Exxon), Japan, and elsewhere by influential firms of the world
18. Solar cells will be used in every home
19. (T) components, materials
    (S) awareness, manpower
20. Private
21. Large firms, company groups
22. (M) silicon ribbon, compound semiconductor ribbon
    (B) solar cell installation project
    (C) solar cell
    (E) inverter
    Production at the rate of 100,000 yen per kW should result in explosive development
23. Large power generation by solar cells will become practical (particularly by making use of the ocean surface)
24. (T) materials, components
    (S) awareness, environment
25. Private, government
26. Government, company group
27. (M) silicon ribbon, chemical semiconductor ribbon, electrode, selective light transmitting ribbon
    (Sys) system engineering
    (C) solar cell, selective light transmission film, underseas power cable
    (Ser) TA, environmental assessment
    (E) giant ocean rafts, light transmitting film washing device
    Suited for power source to drive aluminum smelters at the lower latitudes
28. Energy Conservation
29. Practical power generation by incinerating sludge from large and medium size cities
30. (T) materials, environment
    (S) organization, awareness
31. Private, government
32. Large firms, government
33. (M) fire resistant material, corrosion and heat resistant steel
    (E) continuous sludge combustor, boiler, turbine, generator
    (Sys) mode for incorporation into general power system
    This has been done in West Germany and northern Europe. It is being tested in Osaka and Tokyo
34. Practical use of chemical reactions using plasma jet (decomposition of oil, coal and other hydrocarbons)
35. (T) materials, theory
    (S) organization, information
36. Private, university
37. Large firms
38. (E) combustor, reaction tower
    Under development at Pollution and Resources Laboratory (Japan) and Bureau of Mines (United States). Direct production of ethylene and acetylene from coal is possible

[Key continued on following page]

39. Energy from explosive reactions will be used in other chemical reactions
40. (T) materials, theory, fabrication method
    (S) awareness
41. University, private
42. Large firms, company groups
43. (M) development and improvement of suitable explosive
    (C) impact wave generation tube
    (E) chemical reaction facility using impact wave energy
    Suitable for production of single crystals such as diamonds and fine ceramic artificial minerals
44. Low grade waste heat (80°C and below) utilization for industrial use and energy conversion will become practical by the development of the necessary technology
45. (T) components, material
    (S) organization, economics
46. Private, government
47. Government, large firms
48. (C) heat pipe
    (E) heat pump, heat exchanger, compressor, absorption cooler
    Heat storage tank, turbine using very low boiling point heat medium
49. Stable Supply of Main Cereals
50. Artificial regulation of nitrogen, phosphate, and potassium fertilizers will be practiced (through microcapsulation, etc.)
51. (T) fabrication method
    (S) organization, awareness
52. Private
53. Large firms
54. (M) selection of microcapsule material, fertilizer, packaging material
    (E) microcapsule pelletizing facility, metered packaging device
    (Sys) fertilizer design
    A single fertilizer application will suffice from planting to harvest.
    Easy to also incorporate pesticide
55. Development of pesticides effective against specific pests (harmful) in singular manner (extermination, sterilizing, prevention of morphological change)
56. (T) materials
    (S) information
57. Government, private
58. Large firms
59. (M) natural pesticide, sex phreromone, metamorphosis preventing hormone, radiation induced sterility of males, etc.

(1) 番号	課 題 名 (2)	(3) 実現時期
3	コムギ、オオムギのアカカビ病耐病性をもつ実用性品種が育成される。 (8)	
4	イネのメイチュウ抵抗性をもつ実用品種が育成される。 (13)	
5	定向突然変異（特定の処理によって、特定の変異が生ずる）が育種技術として実用化される。 (18)	
6	高等植物の温度・水分などの物理的生態情報が無損傷、瞬時経時的に同時に計測する技術が開発される。 (23)	
7	一代雑種コムギがひろく栽培されるようになる。 (28)	
8	高等植物の呼吸・光合成・転流蒸散などの生理的諸情報が無損傷、瞬時経時的に同時に計測される技術が開発される。 (33)	
9	耕地生態系の構造と機能が解明され、耕地の生産を安定にする技術が開発される。 (38)	
10	土壌のバクテリア・リーチング（土壌中の不溶性有効成分を植物が利用できる形とする）。 (43)	
11	高等植物の糖質・脂質・たん白質・活性物質などの生化学的情報を無損傷、瞬時経時的に計測し同時に計算する技術が開発される。 (48)	
12	一代雑種イネがひろく栽培されるようになる。(53)	
13	化学物質によるイネの冷害の防止が実用化される。 (58)	
14	C_4植物の機能をもったイネの実用品種が育成される。 (63)	

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funds
7. Comment
8. Varieties of wheat and barley resistant to red smut disease will be developed
9. (T) theory, materials, fabrication method, other
   (S) organization, awareness
10. Government
11. Government

(4) [illegible]	(5) [illegible]	(6) [illegible]	コメント (7)
(9) [illegible] 材料・加工 [illegible]・その他 [illegible]・[illegible]	(10) [illegible]	(11) [illegible]	(12) [illegible] こうしたものはシステム的で、[illegible]
(14) [illegible]	(15) [illegible]	(16) [illegible]	(17) [illegible] イネの [illegible]。[illegible]
(19) [illegible]	(20) 大学	(21) [illegible]	(22) [illegible] ホルモン、アルカロイド等、[illegible]。[illegible] サービス。
(24) [illegible]	(25) [illegible]・大学	(26) [illegible]	(27) [illegible] 子、トレーサー [illegible]、[illegible] カウンター、計測器、生化学センサ、[illegible] センサ、[illegible] コンピュータ、生化学分析装置。
(29) [illegible]	(30) [illegible]	(31) [illegible]	(32) [illegible] コムギ。[illegible]
(34) [illegible]	(35) [illegible]	(36) [illegible]	(37) [illegible] 子、トレーサー [illegible]、[illegible] カウンター、計測器、生化学センサ、[illegible] センサ、[illegible] コンピュータ、生化学分析装置。
(39) [illegible]	(40) [illegible]	(41) [illegible]	(42) [illegible]
(44) [illegible]	(45) 大学	(46) [illegible]	(47) [illegible] バクテリア [illegible]、バクテリア [illegible]、とくにリン [illegible]
(49) [illegible]	(50) [illegible]	(51) [illegible]	(52) [illegible] 子、トレーサー [illegible]、[illegible] カウンター、計測器、生化学センサ、[illegible] センサ、[illegible] コンピュータ、生化学分析装置。
(54) [illegible]・その他 [illegible]	(55) [illegible]	(56) [illegible]	(57) [illegible] イネ。[illegible] とくに [illegible]
(59) [illegible]	(60) [illegible]	(61) [illegible]	(62) [illegible] エアロゾル [illegible]。[illegible] システム。
(64) [illegible]	(65) [illegible]	(66) [illegible]	(67) [illegible] タイプのイネ。[illegible]

12. (M) practical wheat and barley varieties resistant to red smut
    (Sys) short term inspection technology of agricultural quality of crops, gene bank
    These results are obtained through systematic and thorough research
13. Rice varieties resistant to rice borer will be developed
14. (T) materials
    (S) organization
15. Government
16. Government
17. (M) practical rice variety resistant to rice borer
    (Sys) gene bank
18. Fixed directional mutation (special mutation caused by specific treatment) becomes a practical plant breeding technology

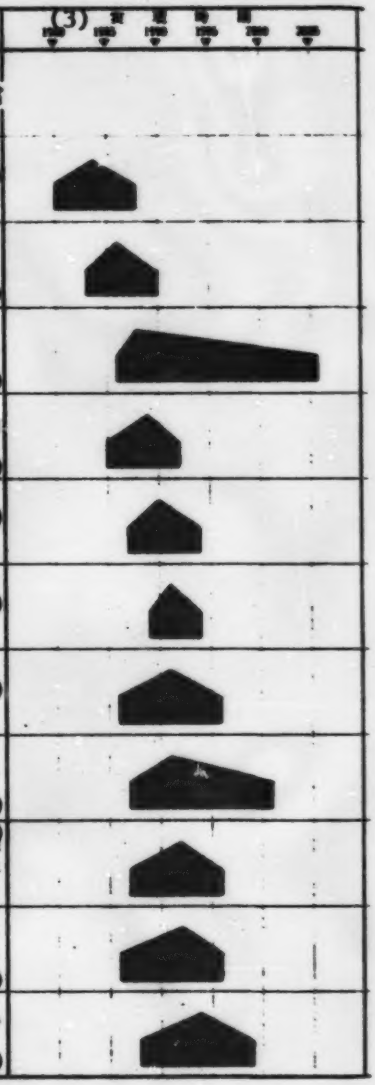
[Key continued on following page]

19. (T) theory
    (S) information
20. University
21. Government
22. (M) RI, plant hormone, alkaloids
    (E) RI irradiation facility, particle accelerator
    (B) radiation farm
    (Ser) training service
23. Technology will be developed for the nondestructive and instantaneous measurement of physical properties such as humidity and water content
24. (T) theory, components
    (S) information
25. Private, university
26. Government
27. (M) tagged atoms, tracer material
    (C) radiation counter, dosimeter, biological sensor, plant physiology sensor
    (E) computer, biochemical analytical facility
28. First generation hybrid wheat becomes widely cultivated
29. (T) materials
    (S) awareness
30. Government
31. Government
32. (M) first generation hybrid wheat
    (Sys) gene bank
33. Technology for the nondestructive and simultaneous calculation of physiological information such as respiration, photosynthesis, and transpiration of high level plants is developed
34. (T) theory
    (S) organization
35. Government
36. Government
37. (M) tagged atom, tracer material
    (C) radiation counter, dosimeter, biochemical sensor, plant physiology sensor
    (E) computer, biochemical analytical facility
38. The structure and capability of cultivation ecology becomes elucidated, and technology to stabilize production of cultivated land is developed
39. (T) theory
    (S) organization
40. Government
41. Government
42. (Sys) elucidation of structure and capabilities of cultivated area ecology system
    Start from research on countless microflora and fauna in the soil
43. Bacteria leaching of soil (to make insoluble but effective components of soil available to plants)
44. (T) theory
    (S) information, organization
45. University
46. Government

[Key continued on following page]

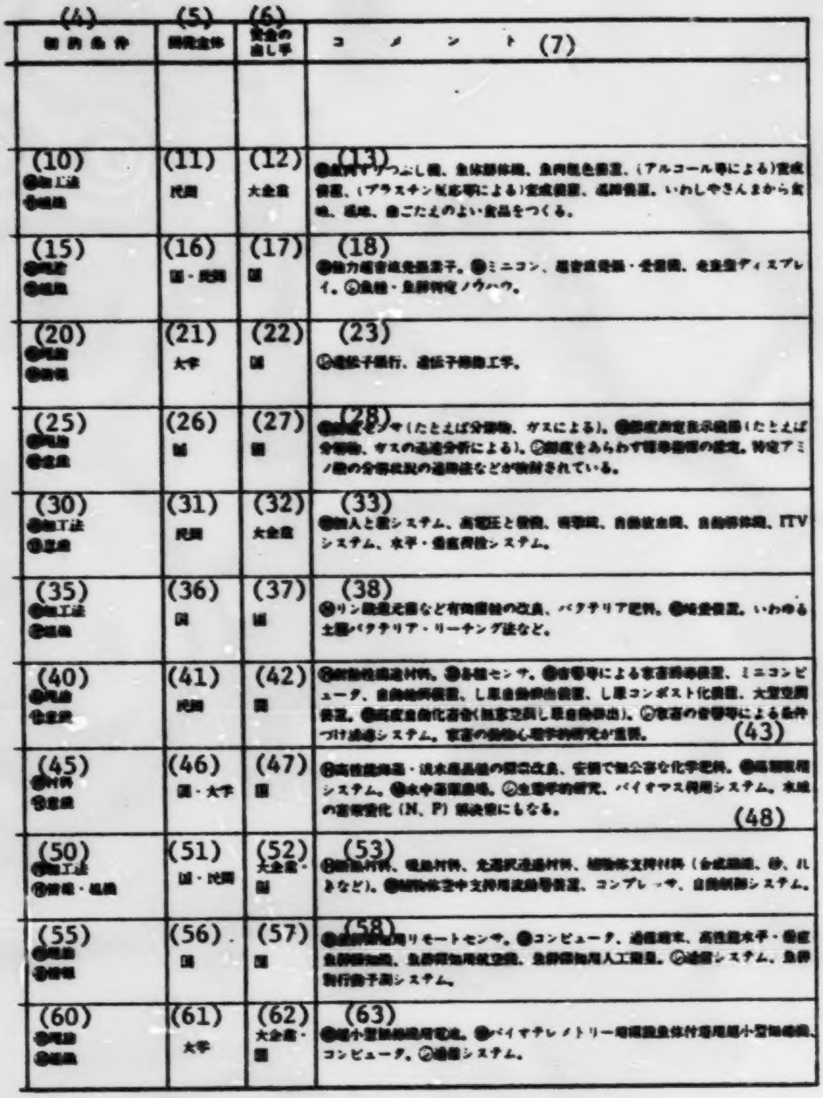
47. (M) bacteria for soil bacteria leaching (search and culture of bacterial species), bacteria fertilizer (produced considering storage and use)
(E) bacteria fertilizer production unit, bacterial propagating facility
Probably useful for trace levels of potassium and phosphorus
48. Technology for the nondestructive and simultaneous timewise measurement of biochemical information such as sugars, lipids, proteins, and active materials of higher class plants is developed
49. (T) theory
(S) information
50. Government
51. Government
52. (M) tagged atom, tracer material
(C) radiation counter, dosimeter, biochemical sensor, plant physiology sensor
(E) computer, biochemical analytical facility
53. First generation rice hybrid becomes widely cultivated
54. (T) materials, other
(S) awareness
55. Government
56. Government
57. (M) first generation hybrid rice
(Sys) gene bank
Revolutionary should rice with C_4 characteristic be developed. Yield will increase
58. Cold damage to rice prevented by the use of chemicals becomes practical
59. (T) theory
(S) information
60. Private
61. Government
62. (M) development of physiologically active materials such as hormone
(E) fogger, aerosol generator, seedling immersion facility
(Sys) research and application system on effects to plant physiology
63. Rice variety with C_4 capability is bred
64. (T) theory
(S) awareness
65. Government
66. Government
67. (M) C_4 type rice
(Sys) gene bank
Photosynthesis goes on actively, uncontrolled by temperature

(1) 順位	課題名 (2)
	(8)飼料　動物性たん白の安定供給
1	未利用魚類を原料とした新しい食品素材の開発。 (9)
2	超音波による水中及び海底魚群探知情報の電子計算機による処理（魚種、魚群量、位置の総合判定）。 (14)
3	染色体工学利用により遺伝的、育種的に病虫害抵抗性が高く、農薬施用量が皆無またはごく少なくてすむ農作物の品種が確立する。 (19)
4	水産物の鮮度をあらわす確実な指標方法、そのための測定機器の実用化 (24)
5	無人と殺処理技術の工業化。 (29)
6	土壌中のリン酸を有効化する技術が開発される。 (34)
7	無人牧場、畜舎管理システムの実用化。 (39)
8	藻類の培養の多目的実用化（O_2を生産することの意義も都市で見逃せなくなる）が行なわれる。 (44)
9	(49) [illegible]（フォクホ　ウス）方式による最も効率の高い栽培技術に必要な材料（断熱、蓄熱、吸熱、吸光、その他生体に必要な環境を支えるための性質をもった）の開発。
10	漁況予報の確立——いつ、どこで、どんな魚が、どれくらい獲れるかという予報がかなりの確かさをもっていえるようになる。 (54)
11	Biotelemetry（電子技術利用の生態観測）による魚類の行動観測技術の実用化。 (59)



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of finding
7. Comment
8. Feed. Stable Supply of Animal Protein
9. Development of new feed material in the form of abundant fish
10. (T) fabrication method
    (S) organization
11. Private
12. Large firms



(4) [illegible]	(5) 開発主体	(6) 資金の出し手	コメント (7)
(10) [illegible]	(11) 民間	(12) 大企業	(13) [illegible]
(15) [illegible]	(16) 国・民間	(17) 国	(18) [illegible]
(20) [illegible]	(21) 大学	(22) 国	(23) [illegible]
(25) [illegible]	(26) 国	(27) 国	(28) [illegible]
(30) [illegible]	(31) 民間	(32) 大企業	(33) [illegible]
(35) [illegible]	(36) 国	(37) 国	(38) [illegible]
(40) [illegible]	(41) 民間	(42) 国	[illegible] (43)
(45) [illegible]	(46) 国・大学	(47) 国	[illegible] (48)
(50) [illegible]	(51) 国・民間	(52) 大企業・国	(53) [illegible]
(55) [illegible]	(56) 国	(57) 国	(58) [illegible]
(60) [illegible]	(61) 大学	(62) 大企業・国	(63) [illegible]

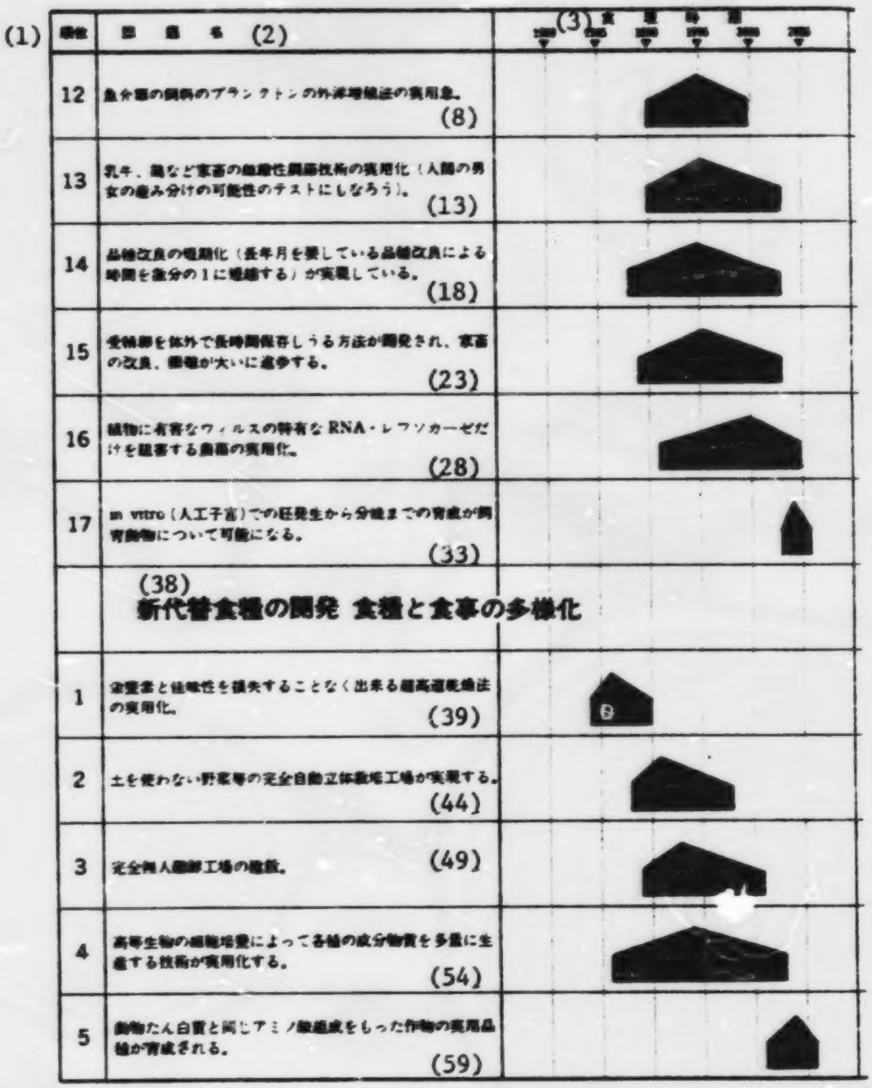
13. (E) fish meat grinder, fish body disintegrator, fish decolorizing facility (using alcohol) denaturing facility (by plastin reaction) denaturation facility, mixer
    Make food of good taste, flavor, and no bones from sardines and mackerel
14. Use of ultrasonic waves for lateral and depth information on location of fish for use with computer processing (overall judgment of fish type, quantity, and location)
15. (T) theory
    (S) organization
16. Government, private
17. Government
18. (C) powerful ultrasonic oscillator element
    (E) minicomputer, ultrasonic generator-receiver, scanning type display
    (Sys) knowhow on fish type and fish school judging

[Key continued on following page]

19. Establishment of animal species of no or very little need for use of agricultural chemicals as the result of resistance to diseases and insects due to genetic and training factors brought about by chromosome engineering
20. (T) theory
(S) information
21. University
22. Government
23. (Sys) gene bank, gene modifying engineering
24. Reliable indicator method to show the freshness of marine products and practical use of instruments for that purpose
25. (T) theory
(S) awareness
26. Government
27. Government
28. (C) freshness sensor (such as through gas given off or degree of decomposition)
(E) freshness indicator (such as through rapid analysis of degree of decomposition or gas given off)
(Sys) establishment of standard values for denoting freshness
Methods such as the determination of specific amino acids is being pursued
29. Industrialization of unmanned slaughtering operation
30. (T) fabrication method
(S) awareness
31. Private
32. Large firms
33. (E) unmanned slaughtering system, high voltage slaughtering machine, impact gun, automated bleeding machine, automated cutting machine, ITV system, horizontal and vertical loading system
34. Development of effective method of using phosphate in soil
35. (T) fabrication method
(S) organization
36. Government
37. Government
38. (M) improvement of effective bacteria for phosphate reduction, bacterial fertilizer
(E) culture facility.
So-called bacteria leaching method of soil
39. Practical development of unmanned grazing and animal husbandry management
40. (T) theory
(S) awareness
41. Private
42. Government
43. (M) corrosion resistant construction material
(C) various sensors (use of sound, etc., to move farm animals about, minicomputer, automated feeding machine, automated excreta removal, automated excreta composting facility, large air conditioning facility)
(E) high level automated animal husbandry (windowless, air conditioned, automated excreta removal facility)
(Sys) condition induction system of animals using sound, etc.
Animal psychology research is important
44. Seaweed culture for multipurpose utilization (production of O_2 is a possibility near urban centers) is practiced

[Key continued on following page]

45. (T) materials
(S) awareness
46. Government, university
47. Government
48. (M) search and improvement of quality seaweed and shallow water cultural varieties, cheap and nonpolluting chemical fertilizer
(E) seaweed harvest system
(B) underwater seaweed farm
(Sys) ecological research, biomass utilization system
Can be solution to nutritional enrichment (N, P) in watery regions
49. Material for fog box mode necessary to most efficient culture technology (thermal insulation, heat absorption, absorbed moisture, absorbed light, and maintenance of other necessary environmental factors) is developed
50. (T) fabrication method
(S) information, organization
51. Government, private
52. Large firms, government
53. (M) heat insulating material, heat absorbing material, selective light transmitting material, plant support material (synthetic fiber, sand, gravel)
(E) fluid layer facility for aerial plant support, compressor, automated control system
54. Forecasting fish schools--where, when, what fish, and how much fish can be expected through previous information becomes practical
55. (T) theory
(S) information, organization
56. Government
57. Government
58. (C) remote sensor for locating fish
(E) computer, communication terminal, high level lateral and vertical fish locator, aircraft for fish location, artificial satellite for locating fish schools
(Sys) communication system, fish group movement prediction system
59. Practical development of fish movement observation through biotelemetry (ecological measurement utilizing electronic technology)
60. (T) theory
(S) organization
61. University
62. Large firms, government
63. (C) ultrasmall radio battery
(E) ultrasmall radio for attachment to fish for use in biotelemetry, computer
(Sys) communication system



(1) 順位	課題名 (2)
12	魚介類の飼料のプランクトンの外洋増殖法の実用化。 (8)
13	乳牛、鶏など家畜の雌雄性調節技術の実用化（人間の男女の産み分けの可能性のテストにしなろう）。 (13)
14	品種改良の短期化（長年月を要している品種改良による時間を数分の1に短縮する）が実現している。 (18)
15	受精卵を体外で長時間保存しうる方法が開発され、家畜の改良、増殖が大いに進歩する。 (23)
16	植物に有害なウィルスの特有なRNA・レプリカーゼだけを阻害する農薬の実用化。 (28)
17	in vitro（人工子宮）での胚発生から分娩までの育成が飼育動物について可能になる。 (33)
	(38) **新代替食糧の開発 食糧と食事の多様化**
1	栄養素と嗜好性を損失することなく出来る超高速乾燥法の実用化。 (39)
2	土を使わない野菜等の完全自動立体栽培工場が実現する。 (44)
3	完全無人屠殺工場の建設。 (49)
4	高等生物の細胞培養によって各種の成分物質を多量に生産する技術が実用化する。 (54)
5	動物たん白質と同じアミノ酸組成をもった作物の実用品種が育成される。 (59)

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Early need to provide external sources of plankton for fish and shellfish feed
9. (T) fabrication method
   (S) organization
10. Government
11. Company groups, government

[illegible] (4)	[illegible] (5)	[illegible] 出し手 (6)	コ メ ン ト (7)
(9) ●[illegible]工[illegible] ●[illegible]	(10) 国	(11) [illegible]	(12) ●大口径FRPパイプ。●大型人工[illegible]、ポンプ、[illegible]プランクトン[illegible](網、ポンプ式)、[illegible]。◎プランクトン[illegible]。
(14) ●[illegible] ●[illegible]	(15) 大学	(16) 国	(17) ●ホルモンその他の生理活性物質。◎家畜の[illegible]技術。
(19) ●[illegible] ●[illegible]	(20) 国	(21) 国	(22) [illegible]、●[illegible]照射装置、粒子加速装置。●[illegible]。◎遺伝子操作、遺伝学的研究。家畜についてできれば革命的。
(24) ●[illegible] ●[illegible]	(25) 国	(26) 国	(27) ●[illegible]、[illegible]システム。◎[illegible]、[illegible]を安全に子宮に戻す方法。とくに牛のように多胎が少なく、[illegible]の長いものにはきわめて有利。
(29) ●[illegible] ●[illegible]	(30) 大学	(31) 大企業・ 国	(32) ●[illegible]ウィルスのRNA・レプリカーゼ[illegible]。[illegible]。◎植物生理研究、[illegible]研究。
(34) ●[illegible] ●人材・[illegible]	(35) 大学	(36) 国	(37) ●人工羊水。●各種生理センサ、多種生化学センサ。●人工子宮装置、人工[illegible]装置。肉用の豚や牛の人工[illegible]生産が可能になる。
(40) ●[illegible]工[illegible] ●[illegible]	(41) 民間	(42) 大企業	(43) ●[illegible]、●[illegible]。
(45) ●材料・電子部品 ●[illegible]	(46) 民間	(47) 大企業	●[illegible]、ガス[illegible]、[illegible]、[illegible]材、人工土壌。●[illegible]ポンプ、コンプレッサ、省エネルギー型大型[illegible]、計測制御システム。◎[illegible]・発電所[illegible]システム。[illegible]を空中に浮かせる[illegible]法も研究されている。[illegible]などを使う。 (48)
(50) ●加工[illegible] ●[illegible]	(51) 民間	(52) 大企業	●各種センサ、●マイクロプロセッサ、ミニコンピュータ、コンピュータ、計測制御システム、カラーITVシステム、高度自動化[illegible]。◎[illegible]の総合的研究。 (53)
(55) ●[illegible] ●人材・[illegible]	(56) 大学	(57) 国	(58) ●[illegible](培養液)、●センサ、●[illegible]装置、コンピュータ。◎生理学的研究。タバコの葉の部分を[illegible]する研究がすすんでいる。
(60) ●[illegible] ●[illegible]・[illegible]	(61) 国	(62) 国	(63) ●[illegible]、[illegible]生理活性物質(植物ホルモン等)。●[illegible]照射装置。●[illegible]。◎遺伝子操作。

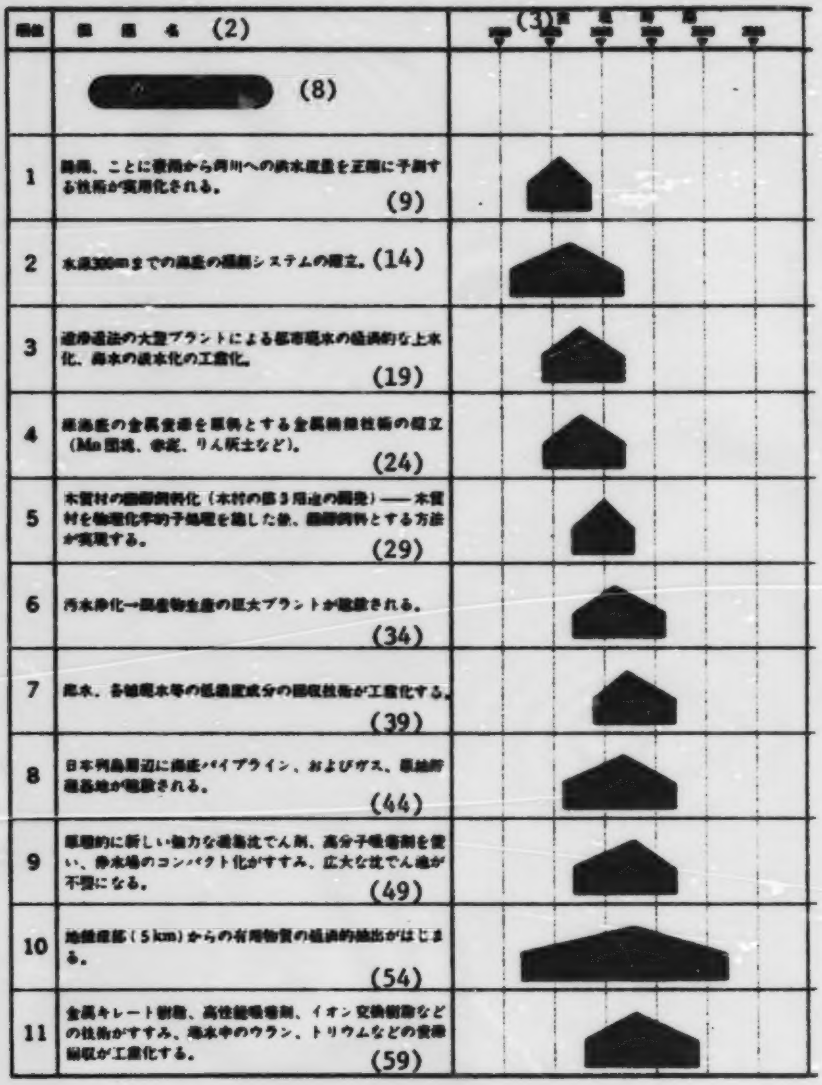
12. (C) large diameter FRP pipe
    (E) large artificial bubbling facility, pump, animal plankton collecting facility (net, pump, etc.), special boats
    (Sys) at sea culture of plankton
13. Practical development of sex adjusting technology applied to milk cows and poultry (may also be a test of human sex ratio in births)
14. (T) theory
    (S) information
15. University
16. Government
17. (M) hormones and other physiologically active materials
    (Sys) sex differentiating technology of domestic animals

[Key continued on following page]

18. Reducing time required for quality improvement (reducing to a fraction of the time required presently to introduce quality improvement in species) becomes practical
19. (T) theory
    (S) organization
20. Government
21. Government
22. (M) RI
    (E) RI irradiation facility, particle accelerator
    (B) radiation farm
    (Sys) gene bank, genetic research
    Would be innovative if applicable to domestic animals
23. Method for preserving egg fertility for long time is developed, and the improvement and propagation of domestic animals are greatly advanced
24. (T) theory
    (S) organization
25. Government
26. Government
27. (E) safe storage of fertile eggs, close environmental control system
    (Sys) safe method of testing egg fertility, method for safe return of fertile egg to uterus
    Particularly advantageous to cows where number of placenta is small and gestation period is long
28. Practical development of agricultural chemicals such that only a specific RNA lefsocaze [phonetic] is blocked in the treatment of plant virus
29. (T) theory
    (S) information
30. University
31. Large firms, government
32. (M) search and improvement of RNA lefsocaze blocking agent of specific virus, agricultural chemical in suitable form
    (Sys) plant physiology research, plant pathology research
33. In vitro (artificial uterus) development of animals from placenta to live birth becomes possible
34. (T) theory
    (S) manpower, information
35. University
36. Government
37. (M) artificial amniotic fluid
    (C) various physiological sensors, multiple biochemical sensors
    (E) artificial uterus facility, artificial fertilizing facility
    Pseudo industrial production of meat animals such as beef or pork becomes possible
38. Development of New Food Substitutes, Multiple Foods and Eating Habits
39. Development of super fast drying method to preserve nutritional value and taste in foods
40. (T) fabrication method
    (S) information
41. Private
42. Large firms
43. (M) liquid nitrogen
    (E) super fast vacuum freezer

[Key continued on following page]

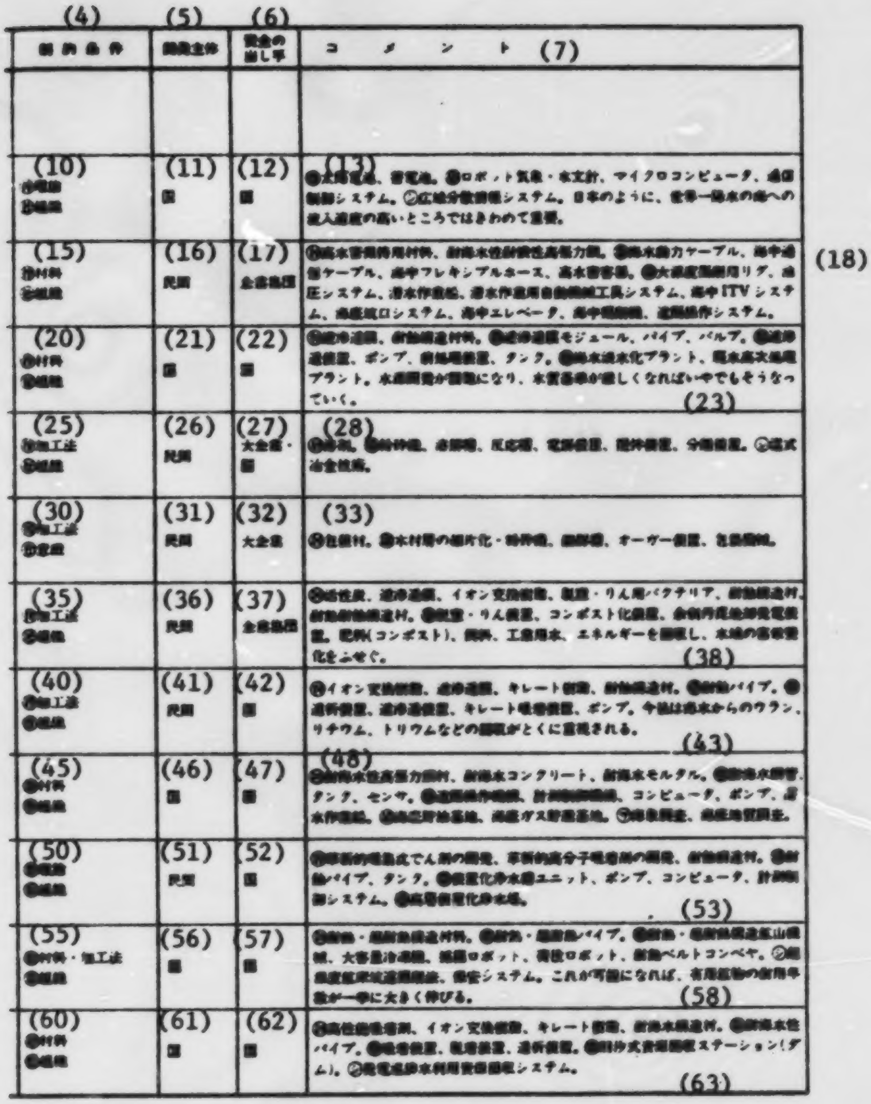
44. Completely automated growing of vegetables without soil becomes practical
45. (T) materials, components
    (S) awareness
46. Private
47. Large firms
48. (M) high strength chemical resistant building material, gaseous fertilizer, liquid fast acting fertilizer, heat insulator, artificial soil
    (E) chemical resistant pump, compressor, energy conserving large air conditioner, measurement and control system
    (Sys) effective utilization system of waste heat such as steelmaking and power plant
    Method in which seedlings are floated in air culture is being researched. Usually fiber is used.
49. Construction of completely unmanned fermentation plant
50. (T) fabrication method
    (S) organization
51. Private
52. Large firms
53. (C) various sensors
    (E) microprocessor, minicomputer, computer, measurement and control system, color ITV system, high level automated continuous fermentation vat
    (Sys) comprehensive research on fermentation process
54. Technology for the production of various products through high level cell culture becomes practical
55. (T) theory
    (S) manpower, information
56. University
57. Government
58. (M) nutrient substrate (nutrients)
    (C) sensor
    (E) cell culture facility, computer
    (Sys) physiological research
    Tissue culture to study tobacco leaf functions is under way
59. Plants incorporating the same amino acid components as animal protein are developed
60. (T) theory
    (S) information, organization
61. Government
62. Government
63. (M) RI, plant physiologically active material (such as plant hormones)
    (E) RI irradiation facility
    (B) gene bank



(1) 順位	課 題 名 (2)	(3) 実 現 時 期
	[illegible] (8)	
1	降雨、ことに豪雨から河川への洪水流量を正確に予測する技術が実用化される。 (9)	
2	水深300mまでの海底の掘削システムの確立。 (14)	
3	逆浸透法の大型プラントによる都市廃水の経済的な上水化、海水の淡水化の工業化。 (19)	
4	深海底の金属資源を原料とする金属精錬技術の確立（Mn団塊、赤泥、りん灰土など）。 (24)	
5	木質材の粗飼料化（木材の第3用途の開発）—— 木質材を物理化学的予処理を施した後、粗飼料とする方法が実現する。 (29)	
6	汚水浄化→微生物生産の巨大プラントが建設される。 (34)	
7	海水、各種廃水等の低濃度成分の回収技術が工業化する。 (39)	
8	日本列島周辺に海底パイプライン、およびガス、原油貯蔵基地が建設される。 (44)	
9	原理的に新しい強力な凝集沈でん剤、高分子吸着剤を使い、浄水場のコンパクト化がすすみ、広大な沈でん池が不要になる。 (49)	
10	地殻深部（5km）からの有用物質の経済的抽出がはじまる。 (54)	
11	金属キレート樹脂、高性能吸着剤、イオン交換樹脂などの技術がすすみ、海水中のウラン、トリウムなどの資源回収が工業化する。 (59)	

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comment
8. Resources
9. Technology to accurately predict the flow of flood water in streams and rivers following rains and particularly torrential rains becomes practical
10. (T) theory
    (S) organization
11. Government
12. Government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13. (C) solar cells, storage battery
    (E) robot weather and hydrology gage, microcomputer, communication control system
    (Sys) widely dispersed information system
    Particularly important in Japan where the rate of flow of rainfall into the sea is greatest in the world
14. Establishment of sea excavation system up to 300 meter depth
15. (T) materials
    (S) organization
16. Private
17. Company groups

[Key continued on following page]

18. (M) material to keep out water tenaciously, sea water and weather resistant high tensile strength steel
(C) underseas power cable, underseas communication cable, underwater flexible hose, high water density container
(E) great water depth drilling rig, hydraulic system submarine working boat, automated machine tool system for submarine operating boat, underseas ITV system, sea bottom excavating system, sea elevator, sea excavating system, sea elevator, sea excavation ring, remote control system
19. Large reverse osmosis plant to provide water to cities economically through desalination of sea water becomes industrialized
20. (T) materials
(S) organization
21. Government
22. Government
23. (M) reverse osmosis membrane, corrosion resistant building material
(C) reverse osmosis module, pipe, valve
(E) reverse osmosis facility, pump, pretreatment facility, tank
(B) seawater desalination plant, high level waste water treatment plant
There is no other recourse since reservoir development is becoming difficult and water quality standards are becoming increasingly stringent
24. Establishment of metal refining technology using raw material recovered from deep sea bottom ores (Mn nodules, red mud, phosphate ash)
25. (T) fabrication method
(S) organization
26. Private
27. Large firms, government
28. (M) solvents
(E) pulverizer, dissolution tank, reaction tank, electrolytic facility, stirring device, separation facility
(Sys) wet metallurgy technology
29. Fermentation of wood to feed (development of third use of wood)
Wood is treated physicochemically and then fermented to feed by a method which becomes practical
30. (T) fabrication method
(S) awareness
31. Private
32. Large firms
33. (M) packaging material
(E) reducing wood scraps in size, pulverizer, fermentation vat, auger, packaging machine
34. Large plant is constructed to treat dirty water → byproduct production
35. (T) fabrication method
(S) organization
36. Private
37. Company groups
38. (M) activated carbon, reverse osmosis membrane, ion exchange resin, denitrifying phosphorus bacteria, corrosion resistant building material, heat and corrosion resistant construction material
(E) de-nitrifying/phosphorizing facility, composting facility, excess sludge incinerating facility, fertilizer (compost), feed, industrial water, energy is recovered and over fertilization of water is prevented

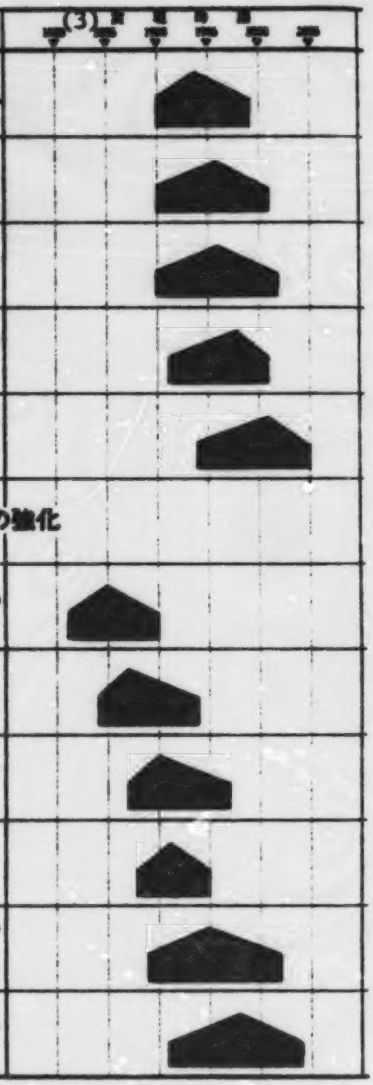
[Key continued on following page]

39. Recovery technology of low concentration components in sea water and various waste waters becomes industrialized
40. (T) fabrication method
(S) organization
41. Private
42. Government
43. (M) ion exchange resin, reverse osmosis membrane, chelate resin, corrosion resistant construction material
(C) corrosion resistant pipe
(E) dialysis apparatus, reverse osmosis facility, chelate adsorption facility, pump
There will be particular emphasis from here on on the recovery of uranium, lithium, and thorium from sea water
44. Underseas pipelines, gas storage, and oil storage bases are constructed in the sea bottom around the Japanese Archipelago
45. (T) materials
(S) organization
46. Government
47. Government
48. (M) seawater resistant high tensile strength steel, seawater resistant concrete, seawater resistant mortar
(C) seawater resistant steel pipe, tank, sensor
(E) remote control mechanism, measurement control mechanism, computer, pump, submarine operating vessel
(B) sea bottom oil storage base, sea bottom gas storage base
(Ser) sea survey, sea bottom survey
49. Compact water cleanup plants using new type coagulation and precipitation agent and polymeric adsorbants are developed eliminating the need for large settling tanks
50. (T) theory
(S) organization
51. Private
52. Government
53. (M) development of innovative floculating and precipitating agent, development of innovative polymeric adsorbant, corrosion resistant construction material
(C) corrosion resistant pipe, tank
(E) water cleansing tank unit, pump, computer, measurement control system
(B) high rise water cleansing facility
54. Economic extraction of materials from great depths (5 km) of the earth's crust begins
55. (T) materials, fabrication method
(S) organization
56. Government
57. Government
58. (M) heat resistant superheat resistant construction material
(C) heat resistant, superheat resistant pipe
(E) heat resistant, superheat resistant construction and mining machinery, large volume freezer, drilling robot, loading robot, heat resistant conveyer
(Sys) very deep mine floor boring method, safety system
Should this become possible, the number of years a mine can be used will be greatly extended

[Key continued on following page]

59. Metal chelate resins, polymeric adsorbants, and ion exchange resin technology advances, and the recovery of uranium and thorium in sea water becomes industrialized
60. (T) materials
    (S) organization
61. Government
62. Government
63. (M) high performance adsorbant, ion exchange resin, chelate resin, sea water resistant construction material
    (C) sea water resistant pipe
    (E) adsorption facility, desorption facility, dialysis facility
    (B) tide resource recovery system (dam)
    (Sys) resources recovery system utilizing waste heat from power plants

(1) 番号	課題名 (2)
12	海水から酸素をとり出す能力をもった膜が実用化される。 (8)
13	海水から重金属、軽金属、貴金属を経済的に分離、回収する技術の工業化。 (13)
14	土の透水性を制御し、地下水を有効に貯留する方式の実用化。 (18)
15	有機物のP−n接合膜が開発され、太陽熱を利用して海洋発電、海水淡水化に利用されるようになる。 (23)
16	炭素資源の枯渇にともない工業より排出される、および大気中の一酸化炭素、炭酸ガスの回収と資源化の開始。 (28)
	(33) 輸出競争力の強化
1	鋼材製造工程上での鋼材の表面、内部の傷の検出が on line 化される。 (34)
2	受注、設計、生産、販売を一貫したコンピュータ・システムが導入され、オーダーメイド的流れ生産方式が確立する。 (39)
3	シミュレーション技術の進歩により、船舶、航空機等の設計が、大型模型実験なしにできるようになる。 (44)
4	化学装置設計のシミュレーション技術が進み、パイロットプラントが不要になる。 (49)
5	コンパクト製鉄所（製銑より少なくとも一次製品までの工程を極度に短縮し、各装置の自動化、連続化を図り、かつ全電算機制御とする方式）の実用化。 (54)
6	自動ラインが自己修復機能をもった機械から構成されるようになる。 (59)



Key:
1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comment
8. A membrane which has the capability of removing oxygen from seawater becomes practical
9. (T) materials
   (S) manpower, awareness
10. Government
11. Government
12. (M) development and improvement of membrane to remove gas and oxygen from seawater (such as silicon resin membrane)

(4) 制約条件	(5) 開発主体	(6) 資金の出し手	コメント (7)
(9) [illegible]材料 [illegible]人材・[illegible]	(10) 国	(11) 国	(12) [illegible]海水から[illegible]・[illegible]をとりだす[illegible]の開発改良（シリコン[illegible]など）。
(14) [illegible]加工法 [illegible]組織	(15) 国	(16) 国	(17) [illegible]材、イオン交換樹脂、キレート樹脂、耐海水性構造材、触媒、試薬。[illegible]吸着装置、脱着装置、溶解槽、反応塔。[illegible]潮汐式資源回収ダム。[illegible]発電所温排水利用資源回収システム。[illegible]環境アセスメント、TA。
(19) [illegible]・加工法 [illegible]組織	(20) 国	(21) 国	(22) [illegible]地下ダム。[illegible]地質調査、水文学的・水理学的調査。
(24) [illegible]材料 [illegible]組織	(25) 国	(26) 国	[illegible]有機半導体の開発・改良、[illegible]。[illegible]有機半導体P−n接合膜、選択透過膜カバー、[illegible]大型[illegible]、[illegible]装置、インバータ、[illegible]システム、自動制御装置、浄化装置、環境アセスメント。塩素、ソーダ、アルミニウムの生産などに有利。 (27)
(29) [illegible] [illegible]	(30) 国	(31) 国	(32) [illegible]、[illegible]ガス[illegible]装置、CO_2とCO分離[illegible]、反応塔、タンク。[illegible]基礎科学研究。CO化学、CO_2化学は将来の化学工業の重要な方向。
(36) [illegible]子部品 [illegible]組織	(36) 民間	(37) 大企業	(38) [illegible]、[illegible]半導体素子、放射線計数管。[illegible]X線装置、RI[illegible]装置、超音波探傷装置、ミニコンピュータ、X線TV装置、超音波TV装置。
(40) [illegible] [illegible]	(41) 民間	(42) 大企業	[illegible]端末装置、ディスプレイ装置、A/D·D/A変換装置、マイクロプロセッサ、ミニコンピュータ、コンピュータ。[illegible]オンラインリアルタイム情報処理システム、各種プログラム・パッケージ、情報検索システム、データバンク・システム。 (43)
(45) [illegible] [illegible]	(46) 国	(47) 国	[illegible]超大型高性能ブロック、超大型光学的3次元ディスプレイ装置、3次元ろう型モデル用NC工作機械、電算機、CAD用インテリジェント端末。[illegible]全絵型CAD用言語、2次元、3次元図化用言語、CAD用データバンク・システム。開発期間の大幅短縮が可能になる。 (48)
(50) [illegible] [illegible]人材	(51) 民間	(52) 大企業 国	[illegible]大型高性能ブロック、大型光学的3次元ディスプレイ装置、3次元モデル用NC工作機械、電算機、CAD用インテリジェント端末。[illegible]全絵型CAD用言語、2次元・3次元図化用言語、CAD用データバンク・システム。 (53)
(55) [illegible]加工法 [illegible]組織	(56) 民間	(57) 大企業	[illegible]装置、連続制御装置、計測制御装置、自動制御装置、マイクロコンピュータ、ミニコンピュータ、コンピュータ、[illegible]装置、[illegible]システム。[illegible]計画設計、エンジニアリング、プログラミング・サービス。[illegible]、[illegible]ガス。[illegible]計測機器、コンパクト[illegible]所は途上国、中進国向けに需要大。 (58)
(60) [illegible] [illegible]	(61) 民間	(62) 国	[illegible]自己表示式工具、[illegible]自己表示式部品、危険・[illegible]検出センサ、AEセンサ。[illegible]工具・[illegible]部品ピッキング・アウト・ロボット、工具・[illegible]ロボット。普通の故障は機械が自分で直して、生産再開できるようになる。 (63)

13. Industrialization of technology to separate and recover heavy metals, light metals, and noble metals from seawater
14. (T) fabrication method
    (S) organization
15. Government
16. Government
17. (M) high performance adsorbant, ion exchange resin, chelate resin, seawater resistant construction material, catalyst, test reagents
    (E) adsorption facility, desorption facility, solution tank, reaction tower
    (B) tide resource recovery dam
    (Sys) resources recovery system utilizing hot waste water from power plant
    (Ser) environmental assessment, TA
18. Permeability of soil is controlled, and underground water is effectively stored by a method which becomes practical

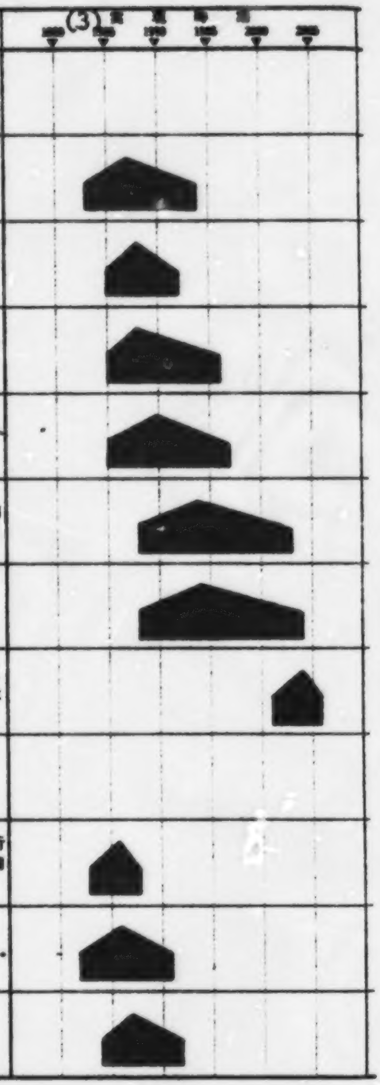
[Key continued on following page]

19. (T) theory, fabrication method
(S) organization
20. Government
21. Government
22. (B) underground dam
(Ser) geologic survey, hydrologic and hydraulic survey
23. Organic P-n bonded membrane is developed to be used to utilize solar heat for ocean power development and seawater desalination
24. (T) material
(S) organization
25. Government
26. Government
27. (M) development and improvement of suitable organic semiconductor
(C) organic semiconductor P-n junction membrane, selectively permeable membrane cover
(E) large floating ocean raft, current collecting device, inverter, sea weather observation system, automated control facility, float-sink facility, environmental assessment. Advantageous for production of chlorine, soda, aluminum.
28. With the depletion of carbon resources, carbon monoxide and carbon dioxide recovery from industrial waste gases and the atmosphere is initiated
29. (T) theory
(S) awareness
30. Government
31. Government
32. (M) catalyst
(E) waste gas collecting facility, CO_2 and CO separation and condensation facility, reaction tower, tank
(Ser) basic scientific research
CO chemistry, and CO_2 chemistry are important to the future of chemical industry
33. Industrial Production: Strengthening Export Competitive Strength
34. Detection of flaws on the surface and interior of steel during its production process is through an on-line method
35. (T) components
(S) organization
36. Private
37. Large firms
38. (M) RI
(C) ultrasonic oscillator element, radiation counter
(E) industrial X-ray facility, RI irradiation facility, ultrasonic flaw finder, minicomputer, X-ray TV facility, ultrasonic TV facility
39. A computer system which performs the order receiving, designing, production, and selling is introduced, and an order-made flow production mode is established
40. (T) theory
(S) awareness
41. Private
42. Large firms
43. (E) communication terminal facility, display facility, A/D·D/A converter, microprocessor, minicomputer, computer
(Sys) on-line real time information processing system, various program packages, information search system, data bank system

[Key continued on following page]

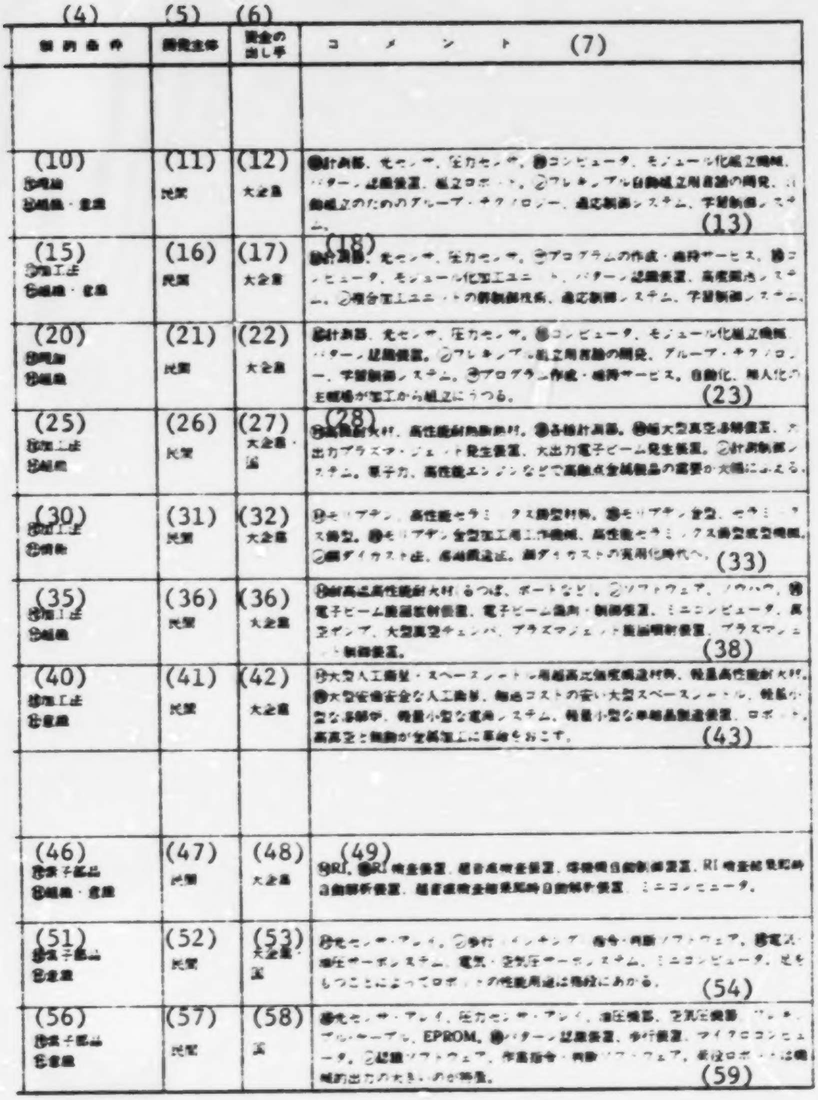
44. Advances in simulation technology enable design of ships and aircraft without the need to construct large models
45. (T) theory
    (S) organization
46. Government
47. Government
48. (E) super large high performance block, super large photochemical 3-dimensional display facility, NC fabrication machine for making 3-dimensional wax models, computer, intelligent terminal for CAD use
    (Sys) interactive CAD language, 2-dimensional 3-dimensional figure making language, data bank system for CAD
    Great reduction in development time is possible
49. Simulation technology on chemical facility design becomes advanced, and pilot plants become superfluous
50. (T) theory
    (S) manpower
51. Private
52. Large firms, government
53. (E) large high performance plotter, large optical 3-dimensional display device, NC fabrication machine for 3-dimensional model, computer, intelligent terminal for CAD
    (Sys) interactive CAD language, language for 2- and 3-dimensional figure making, data bank system for CAD
54. Practical development of compact steelmaking plants (steelmaking and at least one other process is greatly reduced, automation and continuous operation of each facility are introduced, and the entire system is computer controlled)
55. (T) fabrication method
    (S) organization
56. Private
57. Large firms
58. (E) direct reduction facility, continuous steelmaking facility, measurement and control facility, automated control facility, microcomputer, minicomputer, computer, continuous pig iron production facility, direct rolling system
    (Ser) plans design, engineering and programming service
    (M) oxygen reducing gas
    (C) measurement equipment
    Compact steelmaking plants are very important to developing and moderately developed countries
59. Automated lines are provided with self-repair capability
60. (T) theory
    (S) awareness
61. Private
62. Government
63. (C) wear self-display tools, damage self-indicating parts, danger and wear detection sensor, AE sensor
    (E) worn tool or damaged part picking out robot, parts and tools installing robot
    Ordinary malfunctions are repaired by the machine itself to restart production

(1) [illegible]	課題名 (2)
	(8) ニーズ多様化への対応 高度化
1	何種類かの似通ったアッセンブリー製品を１ラインでラインの組替えなしに組立てる自動組立装置が広範に実用化される。 (9)
2	何種類ものちがった加工方法（切削加工、放電加工、溶接、溶断、塑性加工、鋳造など）の何セットもの自動加工ラインが群制御されるようになる。 (14)
3	多種少量生産製造工業で学習機能をもった自動組立機からなる自動組立ラインシステムが実用化される。 (19)
4	プラズマ・ジェット、電子ビーム等によるW、Mo、Nb、Zrなどの高融点金属の精錬が実用化される。 (24)
5	精度±0.02mm、寸法200mm程度の超精密鋼鋳物が実用化される。 (29)
6	無マクロ鋳塊偏析の造塊技術が実用化される。 (34)
7	超高純度金属、無転位金属、巨大単結晶金属などをつくる宇宙冶金工場の出現（巨大人工衛星が安価にできるようになって)。 (39)
	高生産性の実現 (44)
1	溶接部の欠陥を自動的にチェックしながら、溶接が進行する帰還（フィードバック）型完全自動溶接装置の実用化。 (45)
2	"足"の機能を工業用ロボットに賦与しうるようになる。 (50)
3	荷役ロボットの実用化。 (55)



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comment
8. Response to Multiple Needs, Higher Level
9. An automated assembly facility which assembles on a single line a number of assemblies with resembling features becomes practical
10. (T) theory
    (S) organization, awareness
11. Private
12. Large firms



(4) 制約条件	(5) 開発主体	(6) 資金の出し手	コメント (7)
(10)	(11) 民間	(12) 大企業	(13)
(15)	(16) 民間	(17) 大企業	(18)
(20)	(21) 民間	(22) 大企業	(23)
(25)	(26) 民間	(27) 大企業・国	(28)
(30)	(31) 民間	(32) 大企業	(33)
(35)	(36) 民間	(36) 大企業	(38)
(40)	(41) 民間	(42) 大企業	(43)
(46)	(47) 民間	(48) 大企業	(49)
(51)	(52) 民間	(53) 大企業・国	(54)
(56)	(57) 民間	(58) 国	(59)

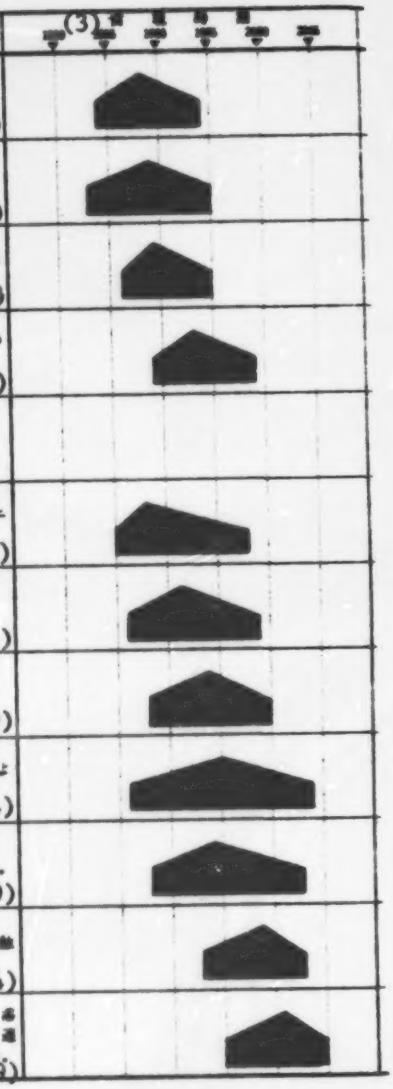
13. (C) measuring equipment, light sensor, pressure sensor
    (E) computer, modularized assembly machine, pattern recognition machine, assembly robot
    (Sys) flexible automated assembly use language development, group technology for automated assembly, responding control system, training control system
14. A number of different fabrication methods (cutting, finishing, discharge machining, welding, burning away, plastic finishing. casting) are run on several sets of automated fabrications lines which are group controlled
15. (T) fabrication method
    (S) organization, awareness
16. Private
17. Large firms

[Key continued on following page]

18. (C) measurement instrument, light sensor, pressure sensor
(Ser) program construction and maintenance service
(E) computer, modularizing fabrication unit, pattern recognition system, high level transport system
(Sys) group control technology of composite fabrication unit response control system, training control system
19. Automated assembly line system consisting of automated assembly machines with learning capabilities in varied small volume multiple variety production becomes practical
20. (T) theory
(S) organization
21. Private
22. Large firms
23. (C) measurement equipment, light sensor, pressure sensor
(E) computer, modular assembly machine, pattern recognition facility
(Sys) development of language or flexible assembly, group technology, training control system
(Ser) program construction and maintenance service
The battlefield of automation and unmanned operation moves to assembly from fabrication
24. Refining of high melting point metals such as W, Mo, Nb, and Zr by plasma jet or electron beam becomes practical
25. (T) fabrication method
(S) organization
26. Private
27. Large firms, government
28. (M) high class fire resistant material, high performance heat resistant thermal insulator
(C) various measurement equipment
(E) superlarge vacuum welding facility, large output plasma jet generation facility, large output electron beam generation facility
(Sys) measurement and control system
Great demand for high melting point metal products in the nuclear power and high performance engine areas
29. Precision of ± 0.02 mm for a dimension of about 200 mm super precise steel products becomes practical
30. (T) fabrication method
(S) information
31. Private
32. Large firms
33. (M) high performance ceramic casting material, molybdenum
(C) molybdenum mold, ceramic casting mold
(E) fabrication machine for making molybdenum metal mold, high performance ceramic casting mold forming machine
(Sys) steel die casting method, weld forging method
To a steel die casting age
34. Ingot making technology in a nonmacro iron ingot segregation process becomes practical
35. (T) fabrication method
(S) organization
36. Private
37. Large firms

[Key continued on following page]

38. (M) superhigh temperature and high performance fire resistant material (for crucibles, boats)
(Sys) software, knowhow
(E) electron beam rotating irradiation facility, electron bean polarization and control facility, minicomputer, vacuum pump, large vacuum chamber, plasma jet rotating injection facility, plasma jet control device
39. Super high purity metals, nondislocated metals, and very large single crystal metals are produced in a space metallurgical plant which will make its appearance (is slated to be operated at low cost in large artificial satellite)
40. (T) fabrication method
(S) awareness
41. Private
42. Large firms
43. (M) large artificial satellite-space shuttle use superhigh specific strength construction material
(E) satellite, large space shuttle of low transportation cost, light and small melting furnace, light and small electric power system, light and small single crystal production facility, robot
High vacuum and no gravity revolutionize metallurgy
44. Emergence of High Productivity
45. Completely automated welding facility which automatically checks for defects while welding proceeds by a feedback mode
46. (T) components
(S) organization, awareness
47. Private
48. Large firms
49. (M) RI
(E) RI inspection facility, ultrasonic testing facility, automatic control device for welder, RI prompt RI inspection results analyzing facility, prompt ultrasonic wave inspection results analyzing facility, minicomputer
50. "Legs" capability is given to industrial robots
51. (T) components
(S) awareness
52. Private
53. Large firms, government
54. (M) light sensor array
(Sys) inching command and judging software
(E) electric and hydraulic servo system, minicomputer
Providing robot with feet greatly increases its performance and applications
55. Appearance of loading robots
56. (T) components
(S) awareness
57. Private
58. Government
59. (C) light sensor array, pressure sensor array, hydraulic equipment, pneumatic equipment, flexible cable, EPROM
(E) pattern recognition facility, scanning facility, microcomputer
(Sys) recognition software, operational command and judgment software
Large mechanical output is feature of loading robot



(1) 番号	課題名 (2)
4	触覚をもち、対象物の表面重量、形状に応じて取扱いを変えることのできるマニピュレーターの実用化。 (8)
5	ロボットの眼（品物を指定すればそれを見分ける能力をもつ）が実用化する。 (13)
6	鋳物製造工程が、少なくとも現在の圧延工程程度に標準化し、自動化、無人化される。 (18)
7	部品の劣化、摩耗に応じて、自動交換機能をもつ機械の製造技術（トラベラー、ピッカーetc）の実用化。 (23)
	(28) 省資源 省エネルギー
1	巨大塔槽類、構造物の経済的な短時間焼付け耐蝕ライニング技術が実用化される。 (29)
2	溶湯から連続的にパイプ、板、条などが製造される。 (34)
3	大型製品も粉末冶金でつくられるようになる。 (39)
4	製鉄用、鋳物用コークス製造用の原料炭として、どのような石炭化度のものでも使用可能になる。 (44)
5	高硬度、高靱性材料の超高圧塑性加工が実現化される。 (49)
6	1原子層程度の貴金属メッキが可能となり、安価で耐蝕性の高い鋼材が実用化される。 (54)
7	現在のバッチ式精錬、製鋼から、完全連続式となり、高炉から鋼まで一貫連続精錬技術が確立し、連続鋳造、連続圧延技術とも接続し、無人製鋼プラントが実現する。 (59)

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comment
8. Practical development of manipulator with sensation of touch which can alter its method of handling according to the weight and shape of the item it is handling
9. (T) components
   (S) information
10. University
11. Government

(4) 制約条件	(5) 開発主体	(6) 資金の出し手	コメント (7)
(9) Ⓣ素子部品 Ⓢ組織	(10) 大学	(11) 国	Ⓒ圧力センサ・アレイ、EPROM。Ⓔマイクロコンピュータ、ミニコンピュータ、マニピュレータ、電気・空気圧（ガス圧）サーボシステム。Ⓢ形状認識ソフトウェア、インターフェイス・ファームウェア。 (12)
(14) Ⓣ素子部品 Ⓢ組織	(15) 大学	(16) 国	(17) Ⓒ光センサ・アレイ、EPROM。Ⓔマイクロコンピュータ、ミニコンピュータ。Ⓢ形状認識ソフトウェア。足、目、触覚とロボットの性能はしだいに人間に近づく。
(19) Ⓣ加工法 Ⓢ組織	(20) 民間	(21) 大企業	Ⓒ高性能合成鋳物砂、高性能断熱材、高性能耐火材。Ⓔ高性能計量機、自動原料投入機、自動溶解投入装置、自動造型機、自動注湯機、自動型ばらし機、[illegible]装置、空調装置、コンピュータ。Ⓢ制御システム、計測制御システム。鋳物は機械工業の「めし」。だからその自動化、無人化はきわめて重要。 (22)
(24) Ⓣ[illegible] Ⓢ人材・資金	(25) 民間	(26) 国	Ⓒ摩耗自己表示式工具、損傷自己表示式部品、危険・摩耗検出センサ、EPROM。Ⓔ摩耗工具・損傷部品ピッキングアウト・ロボット、工具・部品取付ロボット、ミニコンピュータ、自動制御システム。機械が故障を自分で直す機械の進化上の一段階。 (27)
(30) Ⓣ[illegible] Ⓢ資金	(31) 大学	(32) 国	(33) Ⓒ[illegible]耐火物成形材の開発・改良。Ⓔ熱センサ、計測器、Ⓔ巨大焼付用[illegible]、大容量均熱装置、ホットスプレー装置、セラミックコーティング装置、コンピュータ。Ⓢ巨大溶炉内温度・温度分布計測制御システム。
(35) Ⓣ加工法 Ⓢ組織	(36) 民間	(37) 大企業	Ⓒ冷却材、耐火材、耐火断熱材、冷却装置用純銅板。Ⓔ光センサ、熱センサ、圧力センサ、ヒートパイプ。Ⓔ連続鋳造装置、連続[illegible]製造機、連続[illegible]製造機、連続形板圧延機、連続形板圧延機、計測制御装置、コンピュータ、各種搬送装置。Ⓢ冷却システム。 (38)
(40) Ⓣ加工法 Ⓢ資金	(41) 民間	(42) 大企業	(43) Ⓒ複合型材料、安価良質な複合金属粉。Ⓔ大型高性能プレス、大型高性能焼結装置、大型真空チェンバ。
(45) Ⓣ加工法 Ⓢ組織	(46) 民間	(47) 大企業	Ⓒ結合材の選択（ピッチ、アスファルト等）、不活性ガス（CO_2、窒素ガスなど）。Ⓔ計量装置、混練装置、成形装置、成型装置、焼成装置、乾式消火装置。Ⓢ石炭の成分・物性の研究。日本のような大型高炉の最大の泣き所が[illegible]の高価格化。それへの対応策。 (48)
(50) Ⓣ加工法 Ⓢ資金	(51) 民間	(52) 大企業	(53) Ⓒ複合型材料。Ⓔ超高圧プレス、複合加熱装置。Ⓢ加工物性の研究。
(55) Ⓣ加工法 Ⓢ資金	(56) 大学	(57) 国	(58) Ⓒ貴金属（金、白金など）、発熱体、電極。Ⓔイオンプレーティング装置、蒸着装置、超大型真空チェンバ。とくに[illegible]などに向くだろう。
(60) Ⓣ加工法 Ⓢ組織	(61) 民間	(62) 大企業	(63) Ⓒ[illegible]、還元剤、高性能耐火材。Ⓢ連続製鋼法。Ⓔセンサ、ランス。Ⓔ[illegible]転炉、コンピュータ、電磁ポンプ、ランス傾斜角調整装置。

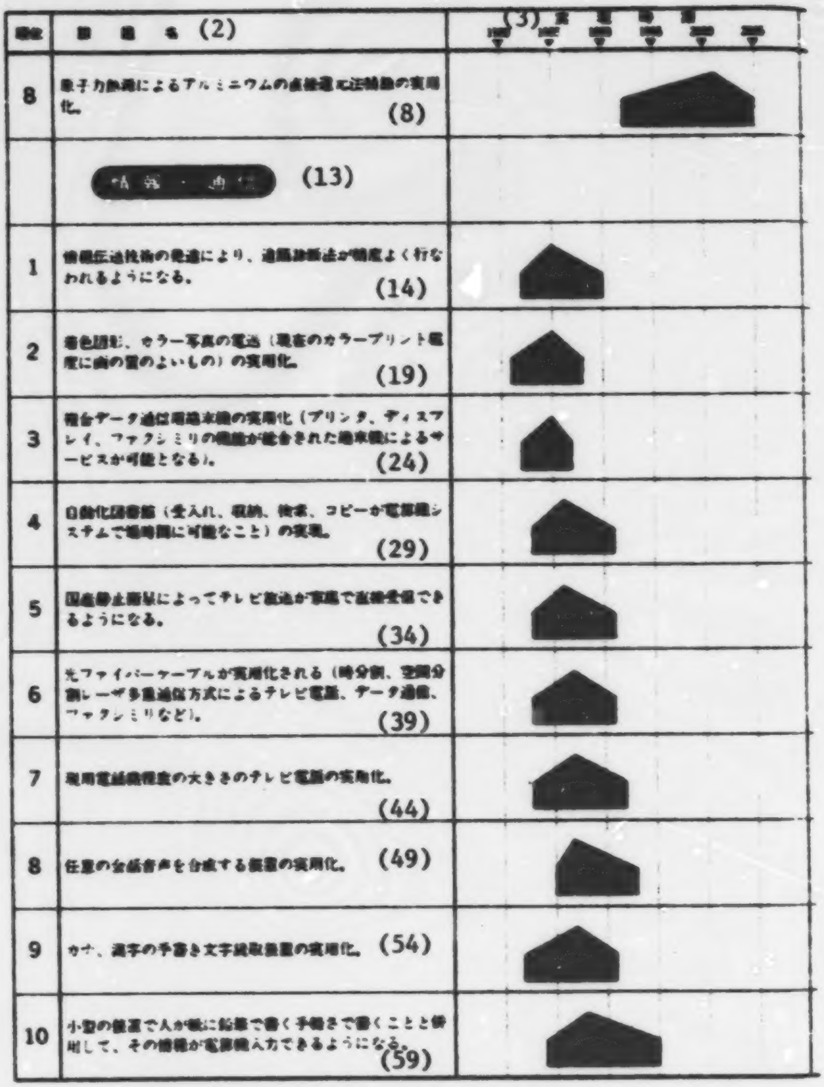
12. (C) pressure sensor array, EPROM
    (E) microcomputer, minicomputer, manipulator, electrical and air pressure (gas pressure) servo system
    (Sys) shape recognition software, interface farmware [phonetic]
13. Eyes for robot (it will be able to distinguish an object which is pointed out to it) become practical
14. (T) components
    (S) organization
15. University
16. Government
17. (C) light sensor array, EPROM
    (E) microcomputer, minicomputer
    (Sys) shape recognition software
    With the acquisition of feet, eyes, and touch, a robot's performance gradually approaches that of man

[Key continued on following page]

18. Iron casting process will be automated and unmanned at least to the stage of present rolling process
19. (T) fabrication method
(S) organization
20. Private
21. Large firms
22. (M) high performance synthetic casting sand, high performance thermal insulator, high performance fire resistant material
(E) high performance metering device, automated raw material feeder, automatic melt feed facility, automated mold making machine, automated form disposal facility, building dust collecting facility, air conditioner, computer
(Sys) group control system, measurement control system
Cast is the "food" for the machine industry. This is why its automation and unmanned status is very important
23. Production technology of machines with automated replacement capability of deteriorated or worn parts becomes practical
24. (T) theory
(S) manpower, awareness
25. Private
26. Government
27. (C) wear self-display tool, damage self-display part, danger and wear detection sensor, EPROM
(E) robot for picking out worn tools and damaged parts, robot for installing tools and parts, minicomputer, automated control system
One step toward machines which rectify by themselves any internal damage
28. Resources Conservation, Energy Conservation
29. Economical corrosion resistant lining which can be put in place in short order on very large towers and tanks becomes practical
30. (T) theory
(S) information
31. University
32. Government
33. (M) development and improvement of suitable corrosion resistant membrane forming material
(C) thermal sensor, measurement device
(E) very large baking kiln, large capacity uniform heating facility, hot press facility, ceramic coating facility, computer
(Sys) very large kiln internal temperature and temperature distribution control and measurement system
34. Pipes, plates, and wires are manufactured continuously from molten metal bath
35. (T) fabrication method
(S) organization
36. Private
37. Large firms
38. (M) coolant, refractory, refractory insulator, pure copper plate for cooling
(C) light sensor, thermal sensor, pressure sensor, heat pipe
(E) continuous ingot producing facility, continuous seamless pipe production facility, continuous electrically seamed steel pipe production facility, continuous thick plate rolling machine, measurement and control facility, computer, various transport devices
(Sys) cooling system

[Key continued on following page]

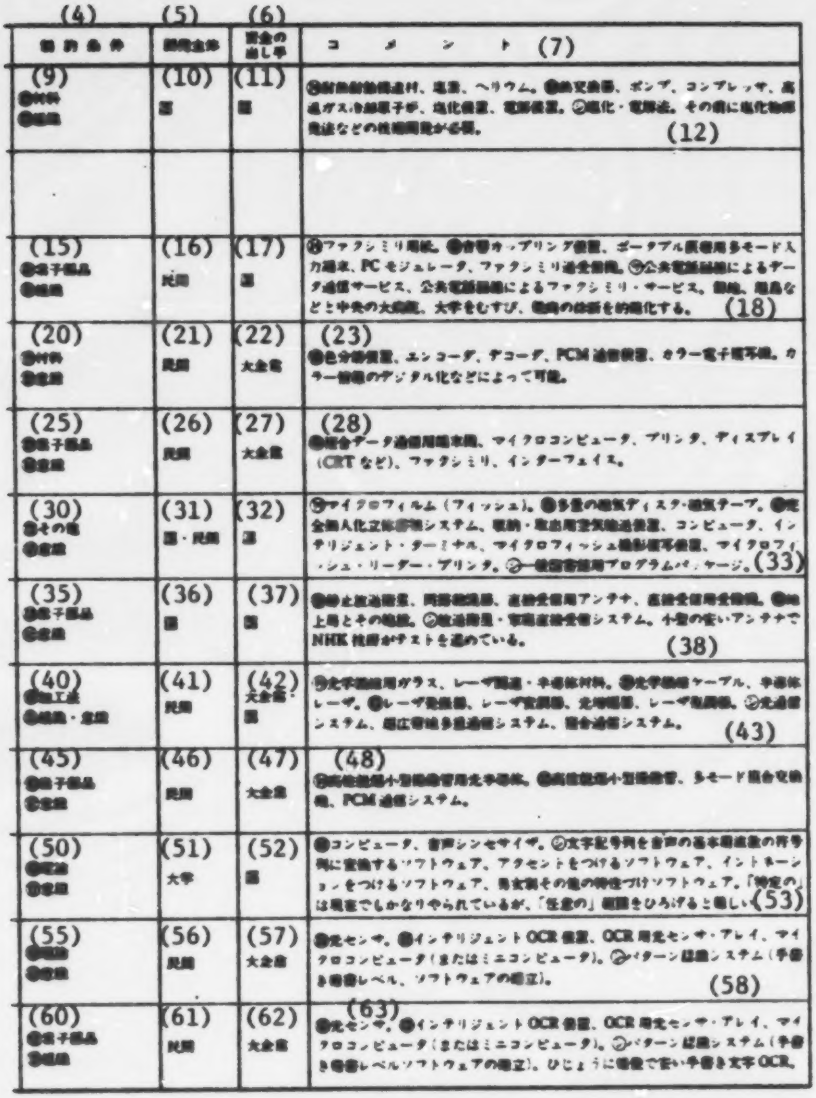
39. Large products will also be made by powder metallurgy
40. (T) fabrication method
    (S) organization
41. Private
42. Large firms
43. (M) suitable mold material, cheap and good quality metal powder
    (E) large high performance press, large high performance sintering facility, large vacuum chamber
44. Any kind of coal will be usable to prepare coke for steelmaking and casting
45. (T) fabrication method
    (S) organization
46. Private
47. Large firms
48. (M) selection of binding material (such as pitch, asphalt), inert gas (CO_2, nitrogen gas)
    (E) metering device, fine pulverizer, mixing device, forming device, sintering device, dry combustion facility
    (Sys) research on coal components and properties
    The high price of caking coal is the sore spot of the Japanese large blasting furnaces. This may be a countermeasure.
49. Superhigh pressure plastic fabrication of very hard and brittle material becomes practical
50. (T) fabrication method
    (S) information
51. Private
52. Large firms
53. (M) suitable mold material
    (E) super high pressure press, suitable heating facility
    (Sys) research on fabrication properties
54. Noble metal plated steel about one atom deep becomes possible, and low cost and high corrosion resistant steel becomes practical
55. (T) fabrication method
    (S) awareness
56. University
57. Government
58. (M) noble metals (such as gold, platinum), heat emitter, electrode
    (E) ion plating device, vapor deposition facility, very large vacuum chamber.
    May be best suited for marine structures
59. The present batch type refining and steelmaking will become continuous type, and a single continuous refining technology from molten iron to steel becomes established which will be alined with continuous casting and continuous rolling technology, and an unmanned steelmaking plant becomes a reality
60. (T) fabrication method
    (S) organization
61. Private
62. Large firms
63. (M) oxygen, slag forming material, high performance refractory
    (Sys) continuous steelmaking method
    (C) sensor, lens
    (E) stepwise conduit type reaction furnace, computer, electromagnetic tank, lance angle adjustment device



(1) 番号	課　題　名 (2)	(3)
8	原子力熱源によるアルミニウムの直接還元法精錬の実用化。 (8)	
	情　報　・　通　信 (13)	
1	情報伝送技術の発達により、遠隔診断法が精度よく行なわれるようになる。 (14)	
2	着色図形、カラー写真の電送（現在のカラープリント程度に画の質のよいもの）の実用化。 (19)	
3	複合データ通信用端末機の実用化（プリンタ、ディスプレイ、ファクシミリの機能が複合された端末機によるサービスが可能となる）。 (24)	
4	自動化図書館（受入れ、収納、検索、コピーが電算機システムで短時間に可能なこと）の実現。 (29)	
5	国産静止衛星によってテレビ放送が家庭で直接受信できるようになる。 (34)	
6	光ファイバーケーブルが実用化される（時分割、空間分割レーザ多重通信方式によるテレビ電話、データ通信、ファクシミリなど）。 (39)	
7	現用電話機程度の大きさのテレビ電話の実用化。 (44)	
8	任意の会話音声を合成する装置の実用化。 (49)	
9	カナ、漢字の手書き文字読取装置の実用化。 (54)	
10	小型の装置で人が紙に鉛筆で書く手軽さで書くことと併用して、その情報が電算機入力できるようになる。 (59)	

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Direct reduction and refining of aluminum using nuclear reactor heat source becomes practical
9. (T) materials
   (S) organization
10. Government
11. Government



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(60) [illegible]	(61) [illegible]	(62) [illegible]	(63) [illegible]

12. (M) heat and corrosion resistant construction material, chlorine, helium
    (E) heat exchanger, pump, compressor, high temperature gas cooled nuclear reactor, chlorination facility, electrolytic facility
    (Sys) chlorine electrolytic method
    There is need beforehand for technology development on volatilization of chlorine materials
13. Information, Communication
14. Advances in information transmission technology enable remote diagnostic methods to be conducted with high precision
15. (T) components
    (S) organization
16. Private
17. Government

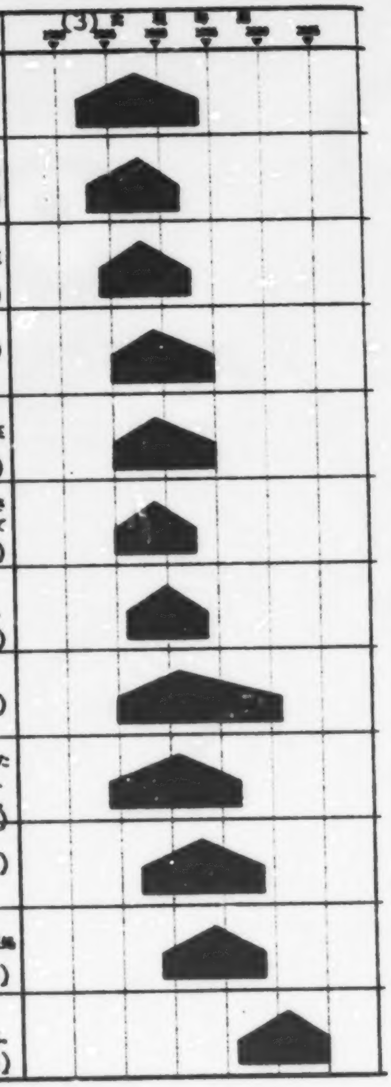
[Key continued on following page]

18. (M) facsimile paper
(E) sound coupling facility, portable input terminal for medical use PC modulator, facsimile transmitter
(Ser) data transmission service using public telephone circuits, facsimile service using public telephone circuits
Tie together remote and outlying islands with central hospital to enable difficult diagnosis
19. Practical colored figures and photograph transmission (quality of present color prints)
20. (T) materials
(S) awareness
21. Private
22. Large firms
23. (E) color analyzer, encoder, decoder, PCM communication facility, color electronic duplicator, color information digitalization may become possible
24. Practical development of multiple data transmission terminal facility (printer, display, facsimile capabilities are incorporated into terminal whose service becomes available)
25. (T) components
(S) awareness
26. Private
27. Large firms
28. (E) multiplex data communication terminal, microcomputer, printer, display (such as CRT), facsimile, interface
29. Automated library (receiving, storage, search, and copying are done in short order by use of computer) makes its appearance
30. (T) other
(S) awareness
31. Government-private
32. Government
33. (M) microfilm (fiche)
(C) large volume magnetic disks and tapes
(E) completely unmanned 3-dimensional bookcase system, air transport facility for storage and retrieval, computer, intelligent terminal, microfiche projecting and reproduction facility, microfiche reader printer
(Sys) general program package for library use
34. Domestically produced stationary satellite broadcasts will be received directly by homes
35. (T) components
(S) awareness
36. Government
37. Government
38. (E) stationary broadcast satellite, satellite-loaded equipment, direct reception antenna, direct reception image device
(B) ground office and its facility
(Sys) broadcast satellite-direct home reception system
NHK is conducting tests with small and cheap antenna
39. Optical fiber cable becomes practical (telephone conversations, data communication, facsimile time and space division laser multiplexing mode)
40. (T) fabrication method
(S) organization, awareness

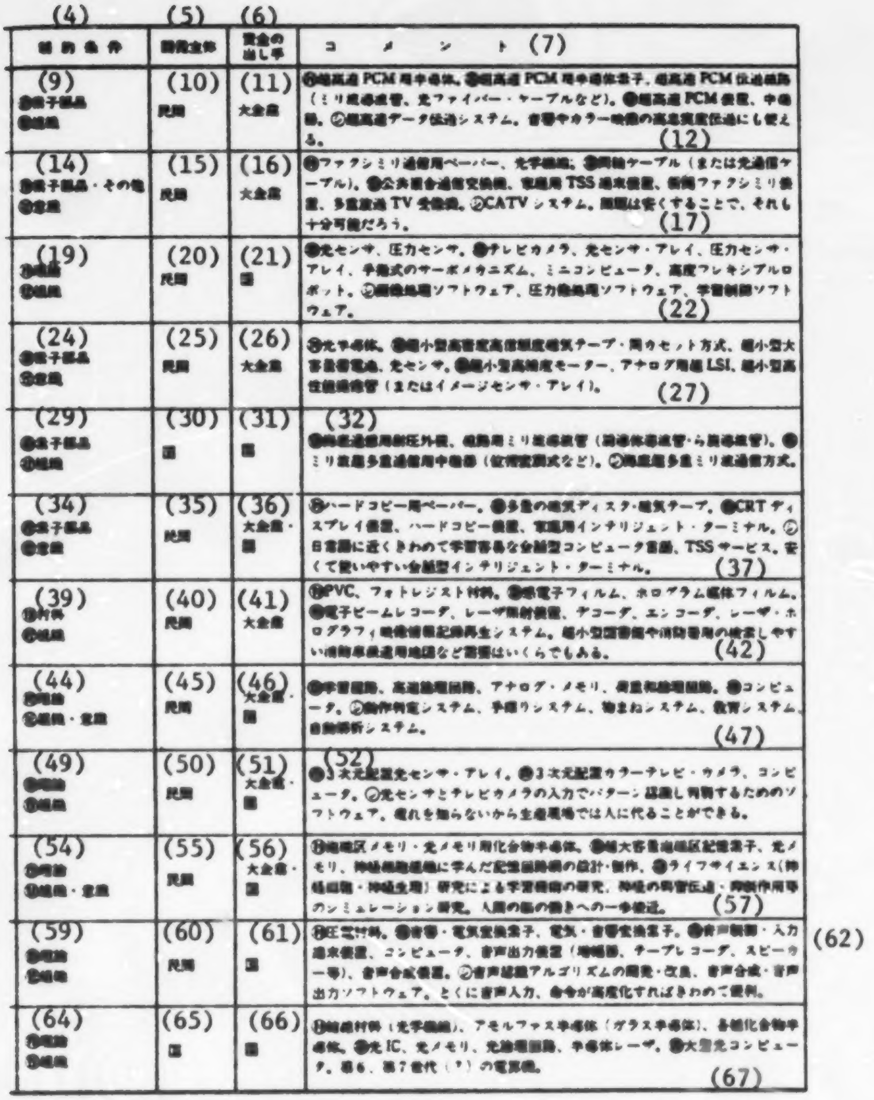
[Key continued on following page]

41. Private
42. Large firms, government
43. (M) glass for optical fiber, laser·semiconductor material
(C) optical fiber cable, semiconductor laser
(E) laser oscillator, laser modulator, photoamplifier, laser demodulator
(Sys) optical communication system, super wideband multiplex communication system, composite communication system
44. Practical development of TV telephone the size of today's telephone
45. (T) components
(S) awareness
46. Private
47. Large firms
48. (M) high performance super small camera tube semiconductor
(E) high performance super small camera tube, multimode composite exchange, PCM communication system
49. Development of facility to synthesize any conversational voice
50. (T) theory
(S) awareness
51. University
52. Government
53. (E) computer, voice synthesizer
(Sys) software to convert basic frequency of character and symbol sounds to symbol series, software which accents, software which puts intonation, software for male and female and other characteristics
"Special" ones are under way at the present time, but it is difficult once the "arbitrary" range is extended
54. Practical handwritten Kana and Kanji character reader
55. (T) theory
(S) awareness
56. Private
57. Large firms
58. (C) optical sensor
(E) intelligent OCR facility, optical sensor array microcomputer (or minicomputer)
(Sys) pattern recognition system (handwritten Kaisho level, establishment of software)
59. A small facility into which a person writes with the pressure normally applied to a pencil and the information is directly input to a computer
60. (T) components
(S) organization
61. Private
62. Large firms
63. (C) optical sensor
(E) intelligent OCR facility, optical sensor array for OCR, microcomputer (or minicomputer)
(Sys) pattern recognition system (establishment of software for handwritten Kaisho level)
Very cheap and convenient handwritten character OCR

(1) 順位	課　題　名 (2)
11	30万ボー以上の高速データ伝送方式の実用化。 (8)
12	家庭用総合情報伝送システムの開発（テレビ新聞、計算機のタイムシェアリング利用など）。 (13)
13	パターン認識（触覚など）を利用した制御システムが実用化される（たとえば物を安定してつかむロボット）。 (18)
14	ポケットVTRの実用化。 (23)
15	ミリ波導波管を用いた幹線ケーブル超多重通信方式の実用化。 (28)
16	家庭用の人間とコンピュータの対話用端末装置が開発され、中央の大型計算機と結ばれ家庭情報センターとしての機能を果たすシステムの開発。 (33)
17	映像情報の経済的で高能率な伝送技法が実用化される。 (38)
18	学習機能をもつ情報処理装置の実用化。 (43)
19	パターン認識の自動化（人間の眼の機能と頭脳を合せた装置が出現して形状の良否、キズ、破損の有無、色彩、数量などを自動的に判別する）のための装置の実用化。 (48)
20	連想記憶方式の実用化。 (53)
21	音声認識、音声合成の技術が格段の進歩をして、情報処理が普通の声で入出力できるようになる。 (58)
22	光の相互作用にもとづく超高速大型光計算機の実用化。 (63)



Key:
1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Practical development of high speed data transmission of 300,000 baud or more
9. (T) components
   (S) organization
10. Private
11. Large firms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12. (M) semiconductor for super high speed PCM use
    (C) semiconductor element for super high speed PCM use, super high speed PCM transmission circuit (millimeter wave guide, optical fiber cable, etc.)
    (E) super high speed PCM device, relay
    (Sys) super high speed data transmission system
    Can be used for faithful transmission of sound and color images
13. Development of comprehensive home information transmission system (TV, newspaper, and computer time sharing, utilization)
14. (T) components, other
    (S) awareness
15. Private
16. Large firms

17. (M) facsimile communication paper, optical fiber
(C) coaxial cable (or optical communication cable)
(E) public multiple communication exchange, home TSS terminal device, newspaper facsimile device, multiplex broadcast TV image receiver
(Sys) CATV system
The problem is lowering cost, and this may be possible
18. Control system utilizing pattern recognition (such as touch) becomes practical (such as a robot which handles objects with safety)
19. (T) theory
(S) organization
20. Private
21. Government
22. (C) optical sensor, pressure sensor
(E) TV camera, optical sensor array, pressure sensor array, finger type servo mechanism, minicomputer, high level flexible robot
(Sys) picture processing software, pressure image processing software, training control software
23. Practical development of pocket VTR
24. (T) components
(S) awareness
25. Private
26. Large firms
27. (M) optical semiconductor
(C) super small high density high reliability magnetic tape, same in cassette, super small large capacity storage battery, optical sensor
(E) super small high precision motor, analog use VLSI, super small high performance image camera tube (or image sensor array)
28. Practical development of multiple transmission mode in underseas cable using millimeter wave guide
29. (T) components
(S) organization
30. Government
31. Government
32. (C) pressure resistant device for sea bottom communication, millimeter wave guide for line use (inductive wave guide, spiral wave guide)
(E) millimeter wave communication multiplex communication relay (phase modulation mode)
(Sys) sea bottom multiplex millimeter wave communication mode
33. Man to computer interactive terminal for home use is developed tied in to a central large computer to serve as home information center in the system which is developed
34. (T) components
(S) awareness
35. Private
36. Large firms, government
37. (M) hard copy paper
(C) large volume magnetic disks and tapes
(E) CRT display device, hard copy device, home use intelligent terminal
(Sys) interactive computer language very close to normal language and very easy to learn, TSS service, safe and easy to use interactive intelligent terminal
38. A new accumulation method of economical and high efficiency picture information collection is developed

[Key continued on following page]

39. (T) materials
    (S) organization
40. Private
41. Large firms
42. (M) PVC, photo resist material
    (C) electron sensitive film, hologram medium film
    (E) electron beam recorder, laser irradiation gear, decoder, encoder, laser holography pictorial information records reproducing system
    There are many uses such as super small libraries and fire departments in the form of easy to find firefighting trucks assignment plan
43. Development of information processing facility with learning capability
44. (T) theory
    (S) organization, awareness
45. Private
46. Large firms, government
47. (C) learning circuit, high speed logic circuit, analog memory, charge sum logic circuit
    (E) computer
    (Sys) operating judgment system, search system, simulating system, teaching system, automated analysis system
48. Automation of pattern recognition (a facility combining the capability of human eyes and brain is developed which recognizes shape, presence of scars or damage, color, and number automatically) facility becomes practical
49. (T) theory
    (S) organization
50. Private
51. Large firms, government
52. (C) 3-dimensionally deployed optical sensor array
    (E) 3-dimensionally deployed color TV cameras, computer
    (Sys) optical sensor and TV camera input pattern recognition discrimination software
    Can replace man because it does not suffer fatigue on the production scene
53. Development of continuous memory mode
54. (T) theory
    (S) organization, awareness
55. Private
56. Large firms, government
57. (M) bubble magnetic region memory, optical memory chemical compound semiconductor
    (C) superlarge volume bubble magnetic region memory element, optical memory, design-fabrication of memory circuit network copying nerve cell tissue
    (E) life science (nerve cells, nerve physiology) research to study learning mechanism, simulation research on simulated transmission and control operation of nerves
    One step closer to brain function of man
58. Voice recognition and voice synthesis technology make great advances such that information treatment can be input and output with ordinary voice
59. (T) theory
    (S) organization
60. Private
61. Government

[Key continued on following page]

62. (M) piezoelectric material
(C) sound-electricity transducer element, electricity-sound transducer element
(E) voice control input terminal device, computer, voice output device (amplifier, tape recorder, speaker, etc.), voice synthesis device
(Sys) development and improvement of voice recognition algorithm, voice synthesis and voice output software
It would be very convenient for voice input and commands to be raised to high level

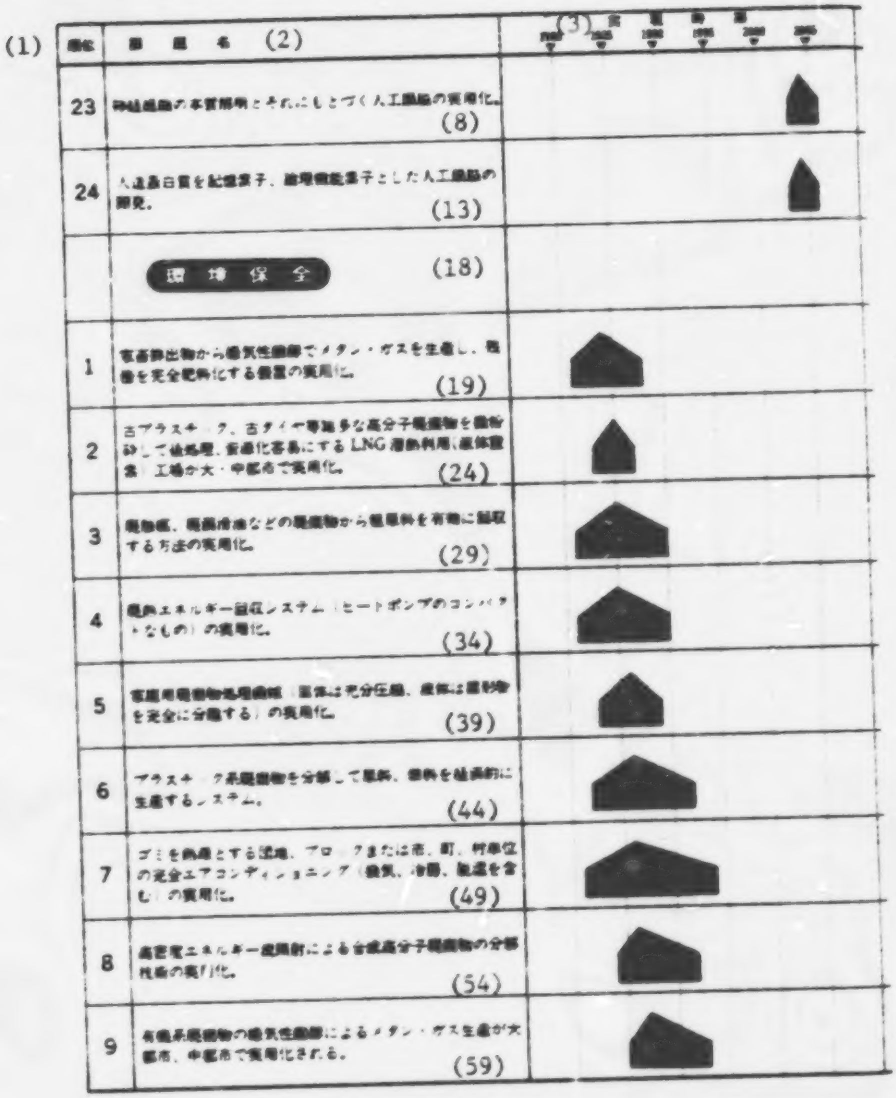
63. Development of superhigh speed large optical computer based on interaction of light

64. (T) theory
(S) organization

65. Government

66. Government

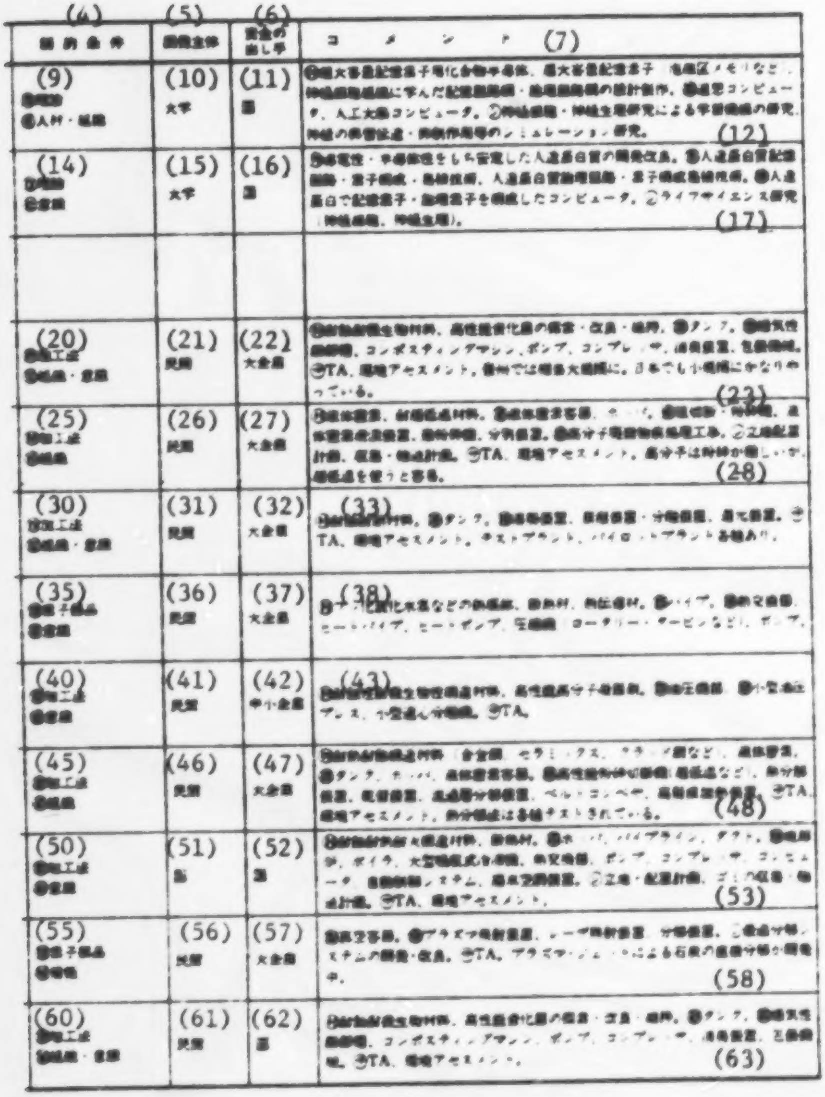
67. (M) line coupling material (optical fiber), amorphous semiconductor (glass semiconductor), various types of chemical compound semiconductors
(C) optical IC, optical memory, optical logic circuit, semiconductor laser
(E) large optical computer. 6th, 7th (?) generation computers



(1) 順位	課 題 名 (2)
23	神経組織の本質解明とそれにもとづく人工頭脳の実用化。 (8)
24	人造蛋白質を記憶素子、論理機能素子とした人工頭脳の開発。 (13)
	環 境 保 全 (18)
1	家畜排出物から嫌気性細菌でメタン・ガスを生産し、残渣を完全肥料化する装置の実用化。 (19)
2	古プラスチック、古タイヤ等雑多な高分子廃棄物を低温粉砕して後処理、資源化容易にするLNG冷熱利用（液体窒素）工場が大・中都市で実用化。 (24)
3	廃触媒、廃潤滑油などの廃棄物から有価物を有効に回収する方法の実用化。 (29)
4	廃熱エネルギー回収システム（ヒートポンプのコンパクトなもの）の実用化。 (34)
5	家庭用廃棄物処理機械（固体は充分圧縮、液体は固形物を完全に分離する）の実用化。 (39)
6	プラスチック系廃棄物を分解して原料、燃料を経済的に生産するシステム。 (44)
7	ゴミを熱源とする団地、ブロックまたは市、町、村単位の完全エアコンディショニング（暖気、冷房、給湯を含む）の実用化。 (49)
8	高密度エネルギー線照射による合成高分子廃棄物の分解技術の実用化。 (54)
9	有機系廃棄物の嫌気性細菌によるメタン・ガス生産が大都市、中都市で実用化される。 (59)

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. True explanation of nerve tissue and practical development of artificial brain based on the knowledge
9. (T) theory
   (S) manpower, organization
10. University
11. Government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12. (M) compound semiconductor for super large capacity memory element, super large capacity memory element (such as bubble magnetic zone memory), design and production of memory circuit network and logic circuit network copying nerve cell tissue
    (E) association computers, artificial brain computer
    (Sys) nerve cell, nerve physiology research to study learning mechanism, simulation research on nerve stimulation transmission and control function
13. [redacted]Development of artificial protein memory element and logic function element use in artificial brain
14. (heory
    (Sy reness
15. Univ
16. Governm

[Key continued on following page]

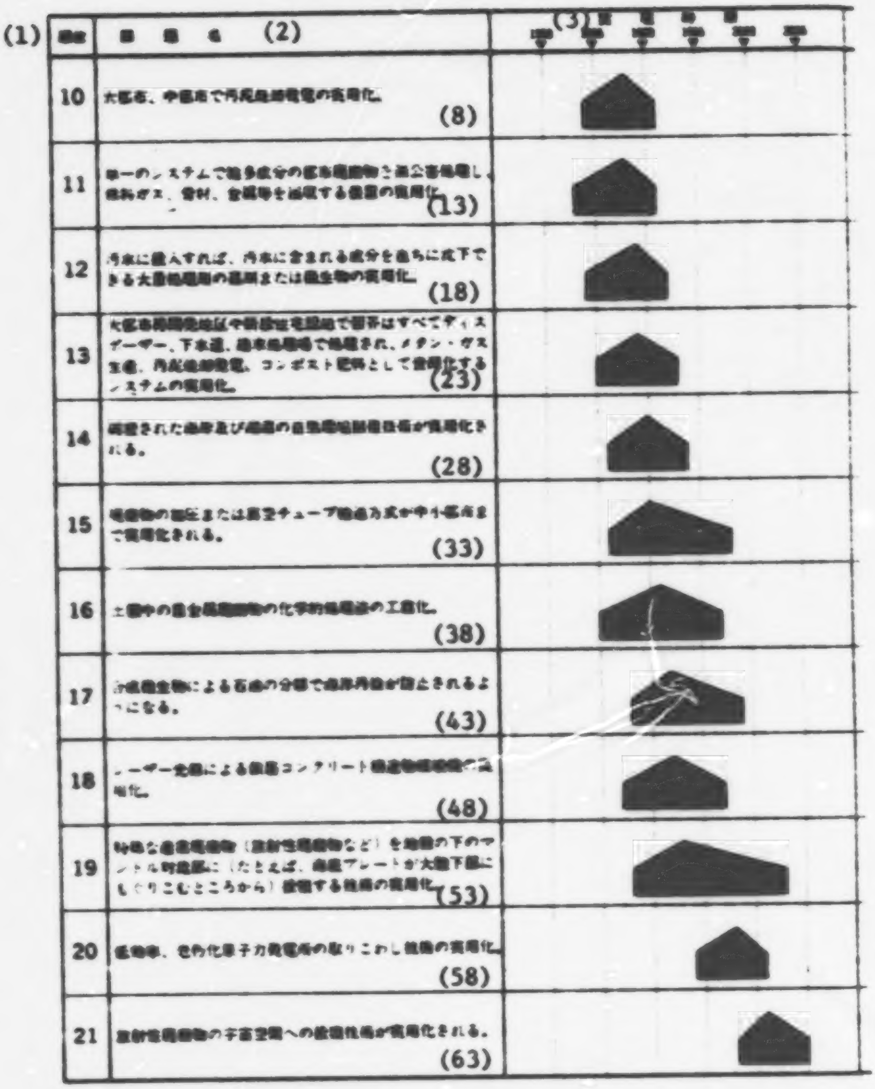
17. (M) development and improvement of artificial protein with electrically conducting and semiconductor properties and is stable
(C) artificial protein memory circuit, element makeup, integration technology; artificial protein logic circuit-element makeup integration technology
(E) computer with memory elements and logic elements made of artificial protein
18. Environmental Protection
19. Production of methane by fermentation of domestic animal excreta with anaerobic yeasts and equipment for conversion of the residue to fertilizer becomes practical
20. (T) fabrication method
(S) organization, awareness
21. Private
22. Large firms
23. (M) corrosion and microorganism resistant material, search, improvement, maintenance of high performance resource making bacteria
(C) tank
(E) anaerobic fermentation tank, composting machine, pump, compressor, deodorizing facility, packaging machine
(Ser) TA, environmental assessment
There is large scale effort in Australia and some small scale efforts in Japan
24. Development of a LNG latent heat utilization (liquid nitrogen) plant to pulverize polymeric waste such as old plastic, old tire and conversion to a form that can be used as resource
25. (T) fabrication method
(S) organization
26. Private
27. Large firms
28. (M) liquid nitrogen, super low temperature resistant material
(C) liquid nitrogen tank, hopper
(E) crude cutting and pulverizing machine, liquid nitrogen immersion facility, fine pulverizer, separator
(B) polymeric waste pretreatment works
(Sys) siting plans, collection and transportation plans
(Ser) TA, environmental assessment
Polymers are difficult to powder but this becomes simple at very low temperature
29. Development of method to effectively recover crude raw material from waste catalysts and waste lubricating oil
30. (T) fabrication method
(S) organization, awareness
31. Private
32. Large firms
33. (M) corrosion and heat resistant material
(C) tank
(E) dissolver, distillation facility-separator, reflux facility
(Ser) TA, environmental assessment, test plant, pilot plant
34. Development of waste thermal energy recovery system (such as heat pump converter)
35. (T) components
(S) awareness
36. Private

[Key continued on following page]

37. Large firms
38. (M) thermal medium such as fluorinated hydrocarbon, thermal insulator, thermal conductor
(C) pipe
(E) heat exchanger, heat pipe, heat pump, compressor (rotary pump, turbine) pump
39. Home use waste processing facility (solids are compacted, liquids are completely rid of solids)
40. (T) fabrication method
(S) awareness
41. Private
42. Medium, small firms
43. (M) corrosion and microorganism resistant construction material, high performance polymeric coagulation agent
(C) hydraulic equipment
(E) small hydraulic press, small centrifugal separator
(Ser) TA
44. System to completely decompose plastic family waste and produce raw material and fuel economically
45. (T) fabrication method
(S) organization
46. Private
47. Large firms
48. (M) heat and corrosion resistant construction material (alloy steel, ceramics, clad steel), liquid nitrogen
(C) tank, hopper, liquid nitrogen container
(E) high performance chopping and powdering machine (for super low temperature), thermolysis facility, dry distillation facility, flow through layer decomposition facility, belt conveyer, high frequency heating device
(Ser) TA, environmental assessment
The thermolysis method has undergone various tests
49. Complete air conditioning system (including air exchange, cooling, dehumidification) for an industrial group, block, city, town, or village unit using trash as heat source becomes practical
50. (T) fabrication method
(S) awareness
51. Government
52. Government
53. (M) corrosion, heat, and fire resistant construction material; thermal insulator
(C) hopper, pipe line, duct
(E) incineration furnace, boiler, large absorption refrigerator, heat exchanger, pump, compressor, computer, automated control system, terminal air conditioner
(Sys) siting deployment plan, rubbish collection transport plant
(Ser) TA, environmental assessment
54. Development of decomposition technology of synthetic polymeric wastes by irradiation with high density energy flow
55. (T) components
(S) information
56. Private
57. Large firms

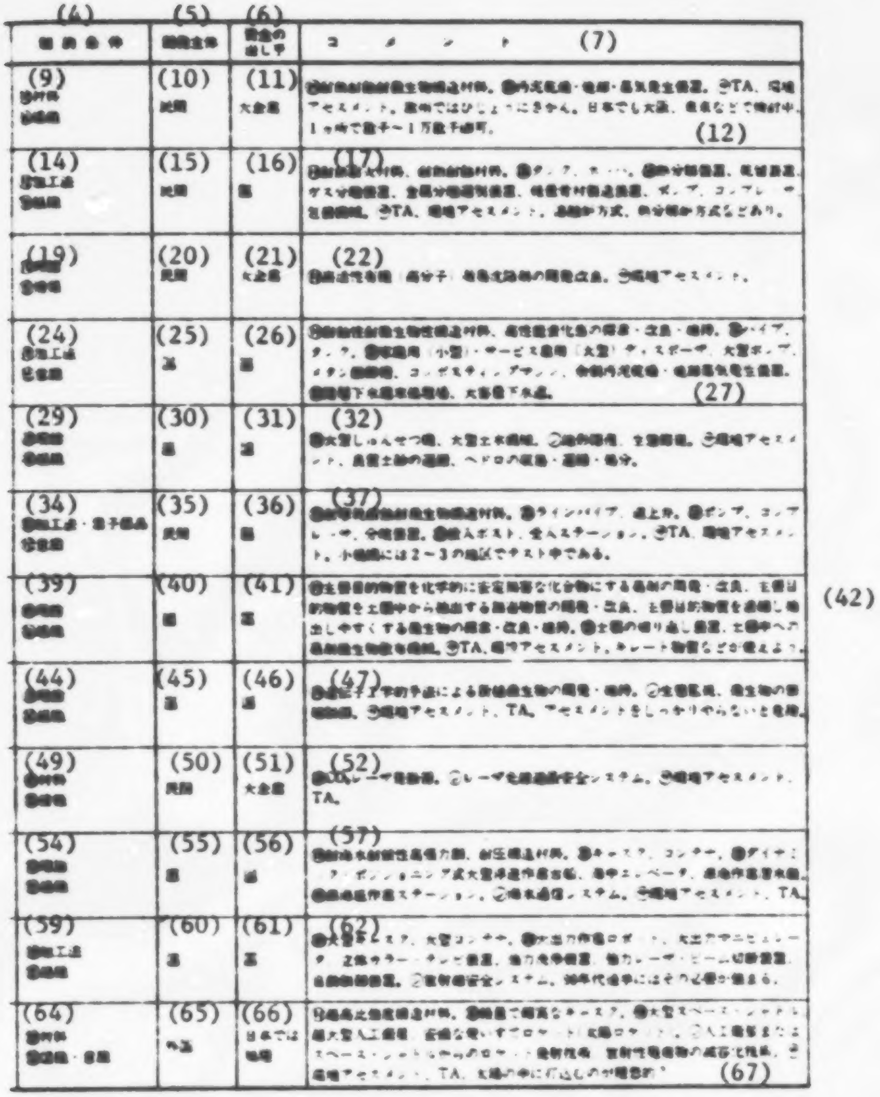
[Key continued on following page]

58. (C) vacuum container
    (E) plasma irradiation facility, laser irradiation facility, decomposition facility
    (Sys) optimum decomposition system development and improvement
    (Ser) TA
    Plasma jet use for direct decomposition of coal is under development
59. Development of methane gas production from organic wastes by anaerobic yeast becomes practical in large and medium size cities
60. (T) fabrication method
    (S) organization, awareness
61. Private
62. Government
63. (M) corrosion and microorganism resistant construction material, search, improvement, culture of high performance resource making bacteria
    (C) tank
    (E) anaerobic yeast culture, composting machine, pump, compressor, deodorizer, packaging machine
    (Ser) TA, environmental assessment



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Practical development of sludge incineration electrical power production in large and medium cities
9. (T) materials
   (S) organization
10. Private
11. Large firms



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12. (M) heat and corrosion resistant microorganism, building material
    (E) sludge drying, incinerating, and steam generating facility
    (Ser) TA, environmental assessment
    Very widely used in Europe. Under study in Osaka and Tokyo. Several thousand to 10,000 kW per site possible
13. Development of nonpolluting facility to recover fuel gas, skeletal material and metals by a single system that converts urban trash
14. (T) fabrication method
    (S) organization
15. Private
16. Government

[Key continued on following page]

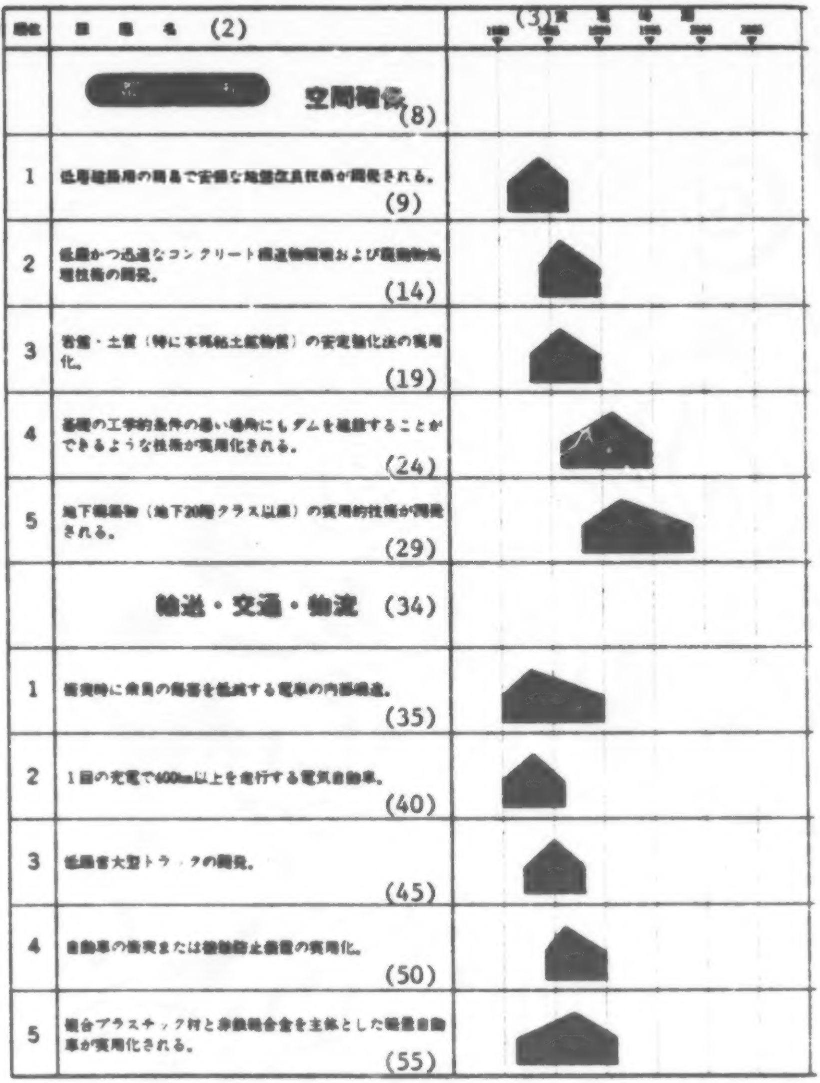
17. (M) heat and fire resistant material, heat and corrosion resistant material
    (C) tank, hopper
    (E) thermolytic facility, drying facility, gas dissociation facility, metal separation and recovery facility, light skeletal material production facility, cylinders, compressors, packaging machine
    (Ser) TA, environmental assessment
    Melting furnace type, thermolytic furnace types available
18. Development of chemical agent or microorganism which when placed in contaminated water immediately precipitates the contaminant enabling large volume water treatment
19. (T) theory
    (S) information
20. Private
21. Large firms
22. (M) high activity organic (polymeric) coagulation and precipitation agent development and improvement
    (Ser) environmental assessment
23. Development of a system for urban redevelopment areas and newly developed residential areas fully equipped with kitchen disposals so sewage is converted to methane gas, sludge incineration power generation, and composted fertilizer
24. (T) fabrication method
    (S) awareness
25. Government
26. Government
27. (M) corrosion and microorganism resistant building material, search, improvement, and culture of high performance resource making bacteria
    (C) pipe, tank
    (E) home use (small) and industrial service use (large) disposer, large pump, methane fermentation tank, composting machine, excess sludge drying, incinerating, and steam generating facility, stair layer sewer terminal treatment site, large volume sewer line
28. Development of technology to restore to its natural environment ravaged seashores and marsh lands
29. (T) theory
    (S) organization
30. Government
31. Government
32. (E) large dredging machine, large construction machines
    (Sys) topography restoration, ecology restoration
    (Ser) environmental assessment, movement of good soil and sand; collection, transport, and disposal of sludge
33. Use of vacuum or pressure tubes to transport waste becomes practical in medium and small cities
34. (T) fabrication method, components
    (S) awareness
35. Private
36. Government

[Key continued on following page]

37. (M) abrasion, corrosion and microorganism resistant construction material
(C) line pipe, check valve
(E) pump, compressor, branching device
(B) drop-in points, receiving station
(Ser) TA, environmental assessment
There are small scale test plants in 2-3 districts
38. Industrialization of chemical treatment methods for recovery of heavy metal wastes in soil
39. (T) theory
(S) organization
40. Government
41. Government
42. (M) development and improvement of agents to convert major objective materials into chemically stable and unharmful compounds, development and improvement of extraction of nontoxic materials from soil, search, improvement and culture of microorganisms which facilitate extraction and concentration of materials
(E) soil turnover device, agent dispersion in soil machine
(Ser) TA, environmental assessment
Chelates may be usable
43. Seashore pollution will be prevented via decomposition of oil by synthetic organisms
44. (T) theory
(S) organization
45. Government
46. Government
47. (M) development and culture of new microfauna by genetic engineering methods
(Sys) ecology type observations, propagation control of microorganisms
(Ser) environmental assessment, TA
Risks involved unless assessments are made properly
48. Development of reinforced concrete structure demolition using laser beam
49. (T) materials
(S) information
50. Private
51. Large firms
52. (E) CO_2 laser oscillator
(Sys) Laser light shielding safety system.
(Ser) environmental assessment, TA[technology assessment].
53. Development of technology to discard special wastes (such as radioactive wastes) in a counterflow manner into the mantle under the earth's crust (such as where the sea bottom plate goes beneath the continental lower section)
54. (T) theory
(S) organization
55. Government
56. Government
57. (M) sea water and weather resistant high tensile strength steel, pressure resistant construction material
(C) cask, container
(E) dynamic positioning large floating barge, sea elevator, submarine deep sea operation vessel
(B) deep sea operation station
(Sys) undersea communication system
(Ser) environmental assessment, TA

[Key continued on following page]

58. Technology to dismantle low efficiency and contaminated nuclear power plants becomes practical
59. (T) fabrication method
    (S) organization
60. Government
61. Government
62. (C) large cask, large container
    (E) large output work robot, large output manipulator, stereo color TV set, forced washing facility, powerful laser beam sectioning facility, automated control system
    (Sys) radiation safety system
    The need will increase near the latter half of the 90's
63. Technology for disposal of radioactive wastes into space becomes practical
64. (T) materials
    (S) organization, awareness
65. Foreign country
66. Too much for Japan
67. (M) superhigh specific strength building material
    (C) light and reliable cask
    (E) large space shuttle, super large artificial satellite, low cost and easy to use rocket (solar rocket)
    (Sys) artificial satellite or space shuttle, rocket launching technology, radioactive waste disposal technology
    (Ser) environmental assessment, TA
    Is it ideal to dispose into the sun?



(1) 順位	課　題　名　(2)	(3) 実 現 時 期
	都市・空間確保 (8)	
1	低層建築用の簡易で安価な地盤改良技術が開発される。 (9)	
2	低廉かつ迅速なコンクリート構造物解体および廃棄物処理技術の開発。 (14)	
3	岩盤・土質（特に不良粘土鉱物質）の安定強化法の実用化。 (19)	
4	基礎の工学的条件の悪い場所にもダムを建設することができるような技術が実用化される。 (24)	
5	地下構造物（地下20階クラス以深）の実用的技術が開発される。 (29)	
	輸送・交通・物流 (34)	
1	衝突時に乗員の傷害を低減する電車の内部構造。 (35)	
2	1回の充電で400km以上を走行する電気自動車。 (40)	
3	低騒音大型トラ・クの開発。 (45)	
4	自動車の衝突または接触防止装置の実用化。 (50)	
5	複合プラスチック材と非鉄軽合金を主体とした軽量自動車が実用化される。 (55)	

Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Cities. Space Preservation
9. Development of low cost foundation improvement technology for low rise construction
10. (T) materials
    (S) organization
11. Private
12. Large firms

(4) 制約条件	(5) 開発主体	(6) 資金の出し手	コメント (7)
(10) ⓜ材料 ⓢ組織	(11) 民間	(12) 大企業	(13) ⓜ凝固時間の制御が容易で無害な（経年毒性のない）地盤強化剤（有機系および無機系）。ⓔ注圧入ポンプ、ボーリング機械。ⓢ地質調査、土質調査。良質安価な宅地の造成可能になる。
(15) ⓣ施工法 ⓢ組織	(16) 民間	(17) 大企業	(18) ⓔ可搬型高周波コンクリート破砕装置、可搬型コンクリート切断装置（レーザ、プラズマ等）。破砕機。都市再開発の決め手。
(20) ⓜ材料 ⓢ組織	(21) 民間	(22) 大企業	(23) ⓜ凝固時間の制御が容易で無害な（経年毒性のない）地盤強化剤（有機および無機系）。ⓔ注圧入ポンプ、ボーリング機械。ⓢ地質調査、土質調査。
(25) [illegible] ⓢ資金	(26) 国	(27) 国	(28) ⓜ地盤強化剤、早強高力セメント。ⓔPCプレハブ堤体部材。ⓔ大型ダンプトラック、ケーブルクレーン、高性能掘削機、ジブクレーン。ⓢ地質調査、土質調査、コンサルテーション、水理・水文調査。
(30) [illegible] ⓢ資金	(31) 民間	(32) 国	ⓜ地中耐食性高張力鋼、地盤強化・凝固剤。ⓔプレハブ土木構造部材の多様化と標準化。ⓔ高性能掘削機械、高性能自走式支保工、コンパクトで強力なくい打ち機（油圧式など）。ⓢ地質調査、土質調査、水理・水文調査。現在の技術水準によれば快適な居住空間、産業用空間の開発可能。 (33)
(36) ⓣ施工法 ⓢ資金	(37) 民間	(38) 大企業	(39) ⓜ衝撃時にまるく割れる窓ガラス、表面が柔らかく弾性ある内装材。ⓔ油圧機器、空気圧機器。ⓔ衝撃吸収構造の車台。
(41) ⓜ材料 ⓢ組織	(42) 民間	(43) 全産業	(44) ⓜ高密度電池、高比強度構造材料（FRP、高張力鋼など）。ⓔ小型大容量2次電池。
(46) ⓣ施工法 ⓢ資金	(47) 民間	(48) 大企業	(49) ⓜ[illegible]材料、吸音材料。ⓔ低騒音タイヤシステム。ⓔ低騒音エンジン、低騒音車両システム。ガスタービン・エンジンだと静かにできる。
(51) ⓢ時間 ⓢ資金	(52) 民間	(53) 大企業	(54) ⓔ油圧・空気圧機器。ⓔ車載用超小型レーダー、自動制御用マイクロコンピュータ、道路車両への警報装置。ガンダイオードなどによる自動車用超小型レーダーの開発が必要。
(56) ⓣ施工法 ⓢ資金	(57) 民間	(58(大企業	(59) ⓜCFRP（車体およびエンジン、足回り部品——フォード研究中）プリプレグ・マット、アルミ合金、マグネシウム合金。ⓔ大型高性能成形加工機械（FRP、CFRPプリプレグ用）。80年代をめざして米フォード、GMが大々的に研究中である。

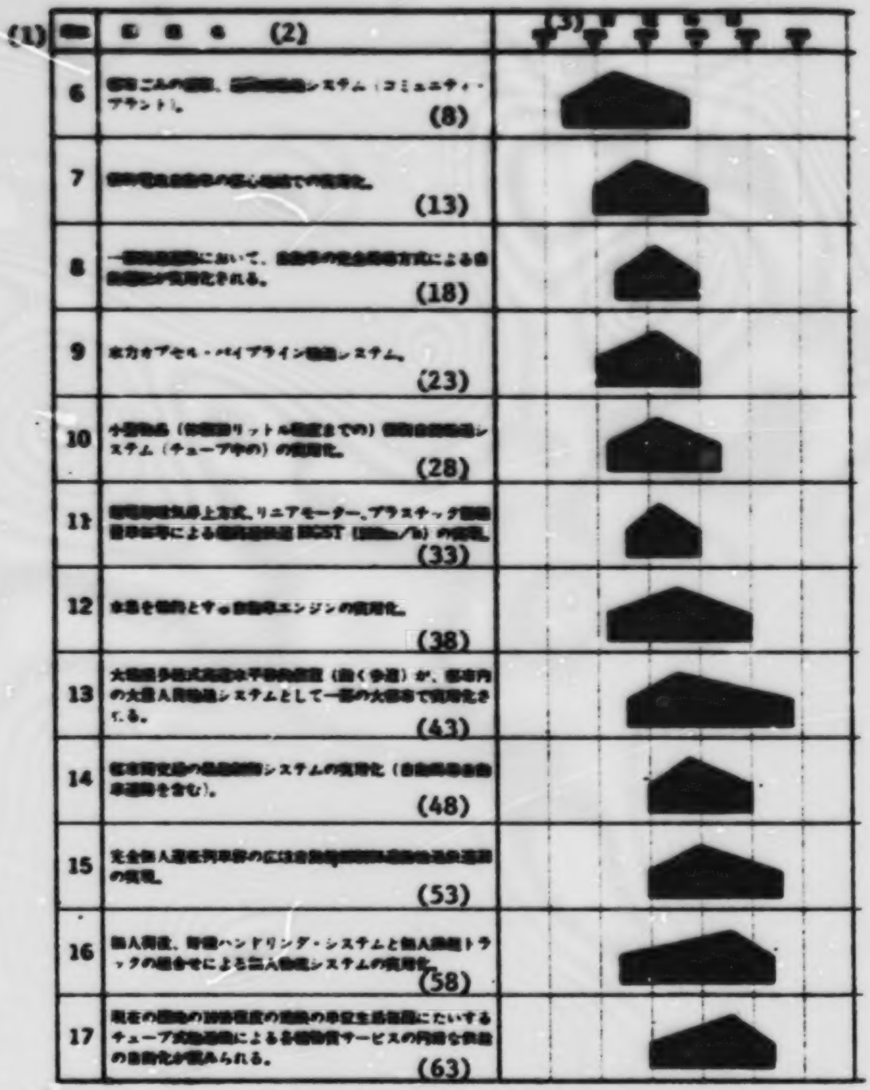
13. (M) foundation reinforcing agent that has short agglomeration time which can be readily controlled and which is nontoxic (no long term toxicity) (organic or inorganic family material)
(E) injection pump, boring machine
(Ser) foundation survey, soil survey
Low cost and good quality residential sites can be produced
14. Development of technology for low cost and rapid demolition of concrete structure and waste disposal
15. (T) fabrication method
(S) organization
16. Private
17. Large firms
18. (E) portable high frequency concrete demolition device, portable concrete sectioning device (such as laser, plasma), pulverizer
Needed for urban redevelopment

[Key continued on following page]

19. Development of stabilizing methods for rock and soil (particularly Japan's clay minerals)
20. (T) materials
    (S) organization
21. Private
22. Large firms
23. (M) foundation reinforcing agent whose solidification time is readily controlled and is not toxic (long term toxicity) (organic or inorganic family)
    (E) injection pump, boring machine
    (Ser) geologic survey, soil survey
24. Technology to enable construction of dams where the engineering properties of the foundation are unfavorable
25. (T) theory
    (S) awareness
26. Government
27. Government
28. (M) foundation reinforcing agent, quick strength and high strength cement
    (C) PC prefab dike material
    (E) large dump truck, cable crane, high performance excavator, jig crane
    (Ser) geology survey, soil survey, consultation, hydraulic, hydrologic survey
29. Development of technology to enable underground construction (20 stories underground or more)
30. (T) theory
    (S) awareness
31. Private
32. Government
33. (M) weather resistant high tensile steel placed in soil, foundation reinforcing and solidifying agent
    (C) multiplicity and standardization of prefab structural materials
    (E) high performance excavating machine, high performance self-propelled scaffold, compact and strong pile driver (such as a hydraulic model)
    (Ser) geologic survey, soil survey, hydraulic, hydrologic survey
    According to present standards of technology, comfortable living space and production space is possible
34. Transportation, Traffic, Material Flow
35. Internal construction of vehicles to reduce injury to passengers upon collision
36. (T) fabrication method
    (S) awareness
37. Private
38. Large firms
39. (M) window glass which breaks in round section on shattering, interior material with soft surface and elasticity
    (C) hydraulic equipment, pneumatic equipment
    (E) dolley with impact absorbing construction
40. Electric automobile capable of traveling more than 400 km per charge
41. (T) materials
    (S) awareness
42. Private
43. Company groups

[Key continued on following page]

44. (M) high density electrolyte, high specific strength construction material (FRP, high tensile strength steel)
(C) small large capacity secondary battery
45. Development of low noise large trucks
46. (T) fabrication method
(S) awareness
47. Private
48. Large firms
49. (M) dynamic vibration preventing material, acoustic material
(C) low noise tire system
(E) low noise engine, low noise suspension system
Gas turbine engine will be quiet
50. Practical device to prevent automobile collisions and contacts
51. (T) theory
(S) awareness
52. Private
53. Large firms
54. (C) hydraulic and pneumatic equipment
(E) vehicle borne super small radar, automatic judgment and control use microcomputer, alarm device to training vehicles, development of super small automobile radar with gunn diode or similar unit is necessary
55. Light automobile using chiefly composite plastics and nonferrous metals becomes practical
56. (T) fabrication method
(S) awareness
57. Private
58. Large firms
59. (M) CFRP (body and engine, undercarriage parts—being researched by Ford) prepreg mat, aluminum alloy, magnesium alloy
(E) large high performance forming fabrication machine (FRP, CFRP prepreg use)
Research under way at Ford and GM aimed for the 80's



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Recovery of urban trash, remote site transport system (community plant)
9. (T) other
   (S) awareness
10. Private
11. Government

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(64) [illegible]	(65) [illegible]	(66) [illegible]	[illegible] (67)

12. (M) abrasion resistant steel for line pipe
    (C) line use pipe, valve, container (container mode)
    (E) pump (center, intermediate), compressor (center, intermediate), container stand, disposer stand, line cleaning equipment
    (Sys) line trash clogging detection system
13. Practical use of fuel cell powered automobile for urban use
14. (T) materials
    (S) awareness
15. Private
16. Large firms
17. (M) fuel for fuel cell (hydrogen, hydrazine, etc.), high performance electrolyte-electrode
    (C) small high output fuel cell
    (E) small high output motor
    (Sys) battery use fuel SS system

[Key continued on following page]

18. Completely guided automobile traffic will be used on a portion of high speed highways
19. (T) theory, components
    (S) organization
20. Government
21. Government
22. (C) road embedded antenna system, vehicle borne antenna
    (E) vehicle borne intelligent terminal, engine, speed changer, steering, brake control microcomputer
    (Sys) computer cascade system, communication system
23. Hydraulic powered capsule and pipeline transport system
24. (T) components
    (S) organization
25. Private
26. Government
27. (M) abrasion resistant steel for line pipe use, high specific strength capsule material
    (C) pipe for line use, valve, pressure sensor
    (E) pump, surge tank
    (B) pipe line depot for input, output, and route transfer of capsules
    (Sys) determination of capsule modules, capsule discrimination, detection system
28. Practical use of automated individual package transport system (through a tube) for small items (volume up to about 30 liters)
29. (T) components
    (S) awareness
30. Private
31. Large firms
32. (M) abrasion resistant steel for line pipe use
    (C) pipe for line use, valve, capsule (container)
    (E) compressor or pump, loading of capsule according to destination, separate loading main terminal facility
    (Sys) discrimination and detection control system of line and capsule (container)
    Make possible automated material flow in residential developments
33. Superconducting magnetic levitation mode, linear motor, plastic light body superspeed railway HGST (500 km/h) is introduced
34. (T) theory, materials, components
    (S) awareness
35. Government
36. Government
37. (M) high specific strength body material such as CFRP, superconducting material, liquid helium
    (C) liquid helium container, coils for superconducting magnet
    (E) superconducting magnet (draw in type or repulsion type), linear motor, track-car gap detection and control facility
    Second Bullet Express for the Tokaido. Absence of noise and vibration pollution is key issue
38. Practical development of automobile using hydrogen as fuel
39. (T) fabrication method
    (S) organization
40. Private
41. Government

[Key continued on following page]

42. (M) liquid hydrogen, metal hydride
(C) liquid hydrogen tank, liquid hydrogen vaporizer, metal hydride container, hydrogen from metal hydride vaporizer
(E) hydrogen engine
This may find great use should hydrogen cost go down
Many advantages and few disadvantages
43. Large scale multibelt high speed horizontal mover (moving sidewalk) comes in use as a means of mass transport in large cities
44. (T) theory
(S) awareness
45. Private
46. Government
47. (M) abrasion resistant steel plate
(C) sealed dustproof bearing, step plate
(E) sealed dustproof and waterproof motor, roadway induction display system, roadway water and dust proof ITV camera
(Sys) wide area control system
48. Optimum control system of interurban traffic (includes guided automobile highways) becomes practical
49. (T) theory
(S) awareness
50. Government
51. Government
52. (C) embedded induction loop antenna, car borne antenna
(E) car borne microcomputer, computer, roadway induction display system, car borne induction display system, AD-DA conversion system, voice synthesis system, roadway super shortwave broadcast system
(Sys) wide area optimum traffic control system, vehicle code system
53. Wide area completely automatically controlled commuter transport railway network including completely unmanned trains become practical
54. (T) components
(S) awareness
55. Government
56. Government
57. (E) learning controller, car borne radar, car borne computer, AD-DA conversion device, voice synthesis broadcast system
(Sys) computer cascade system, communication system, wide area automated comprehensive control system
Multiple fail-safe system development is important
58. Unmanned loading, storage handling system, and unmanned truck combination making up an unmanned material flow system becomes practical
59. (T) theory
(S) organization
60. Private
61. Government
62. (C) car borne antenna, road surface loop antenna, tag printed with magnetic ink
(E) switch equipped with automated recognition device, robot fork lift, microcomputer truck
(B) unmanned 3-dimensional storage
(Sys) product, load, transport codes standardization, radio guidance system
Unmanned truck can be sent over fairly complex routes as long as the route is set

[Key continued on following page]

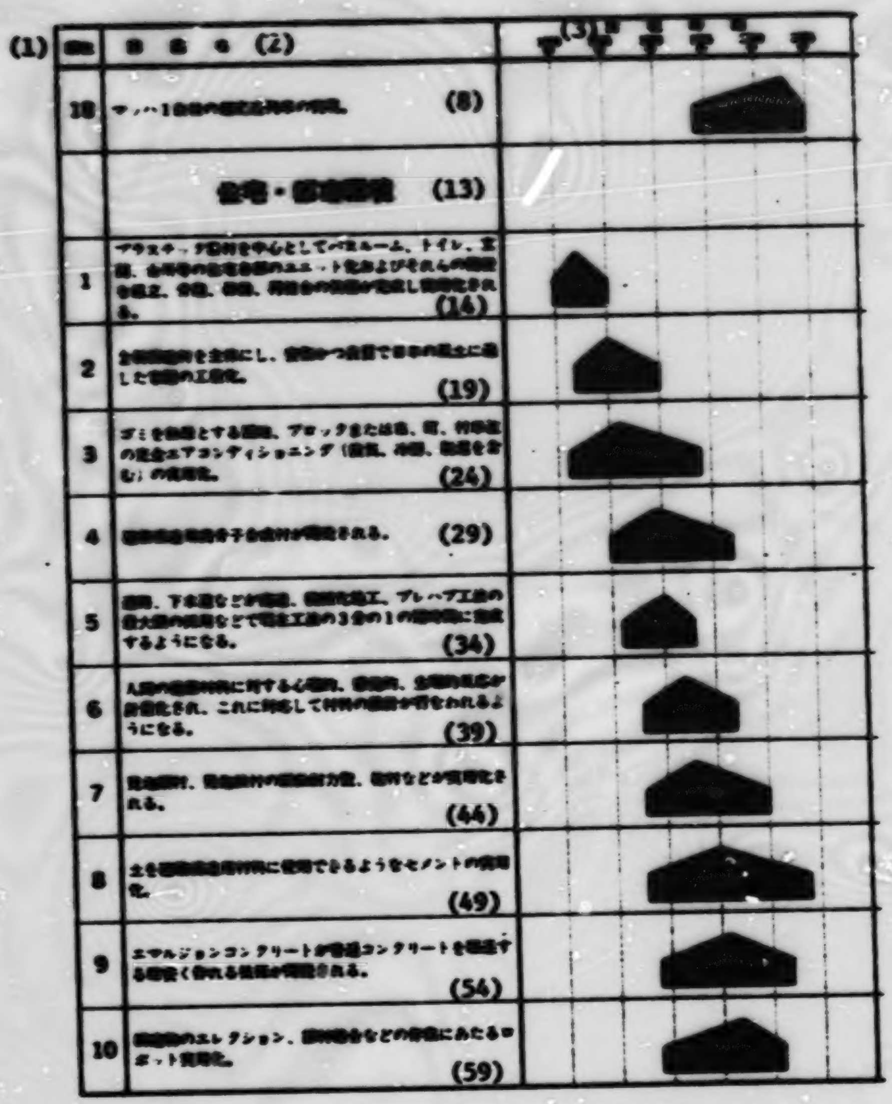
63. Tube type transport device will be experimentally installed in housing developments roughly 10 times the size of present developments through which various materials and services will be handled automatically

64. (T) theory
(S) awareness

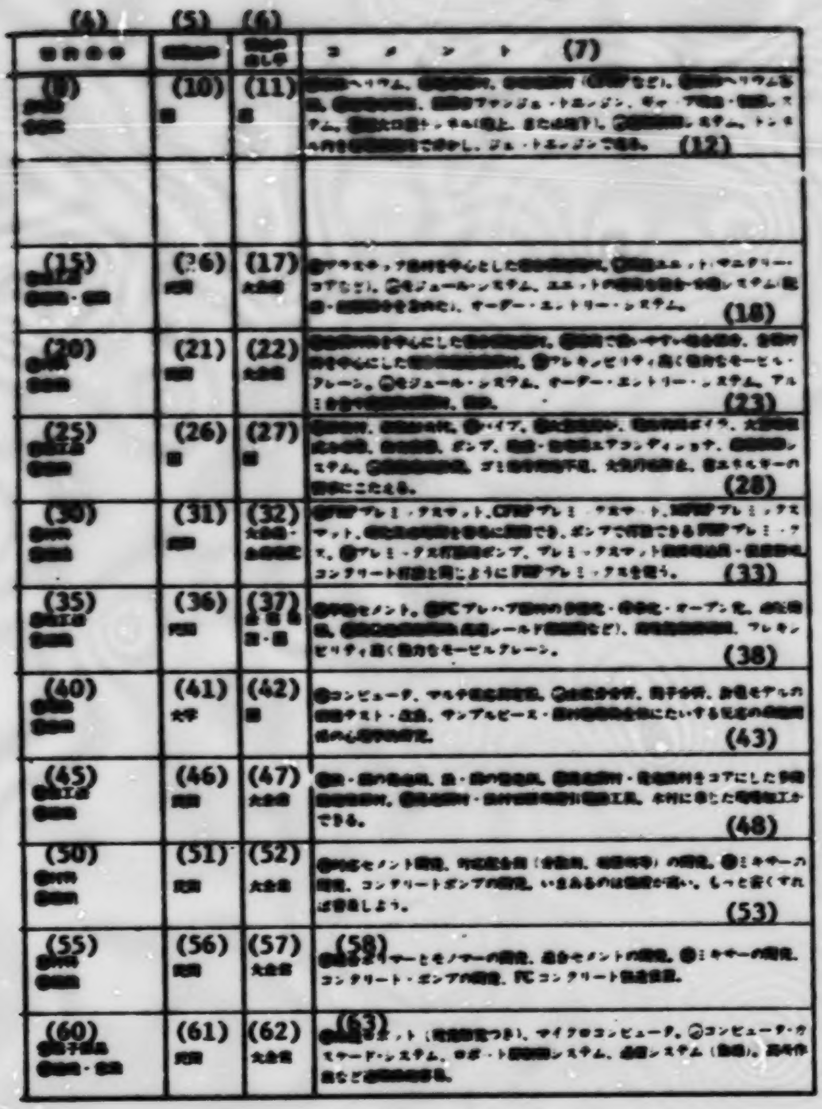
65. Government

66. Government

67. (M) abrasion resistant steel
(C) container, cold container, liquid container, line pipe, dolley, individual container discrimination facility
(E) cylinder, compressor, switching system, computer
(B) individual receiving station, central receiving station, unmanned 3-dimensional storage
(Sys) discrimination, control system



Key:
1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Development of Mach 1 superhigh speed train
9. (T) theory
   (S) awareness
10. Government
11. Government



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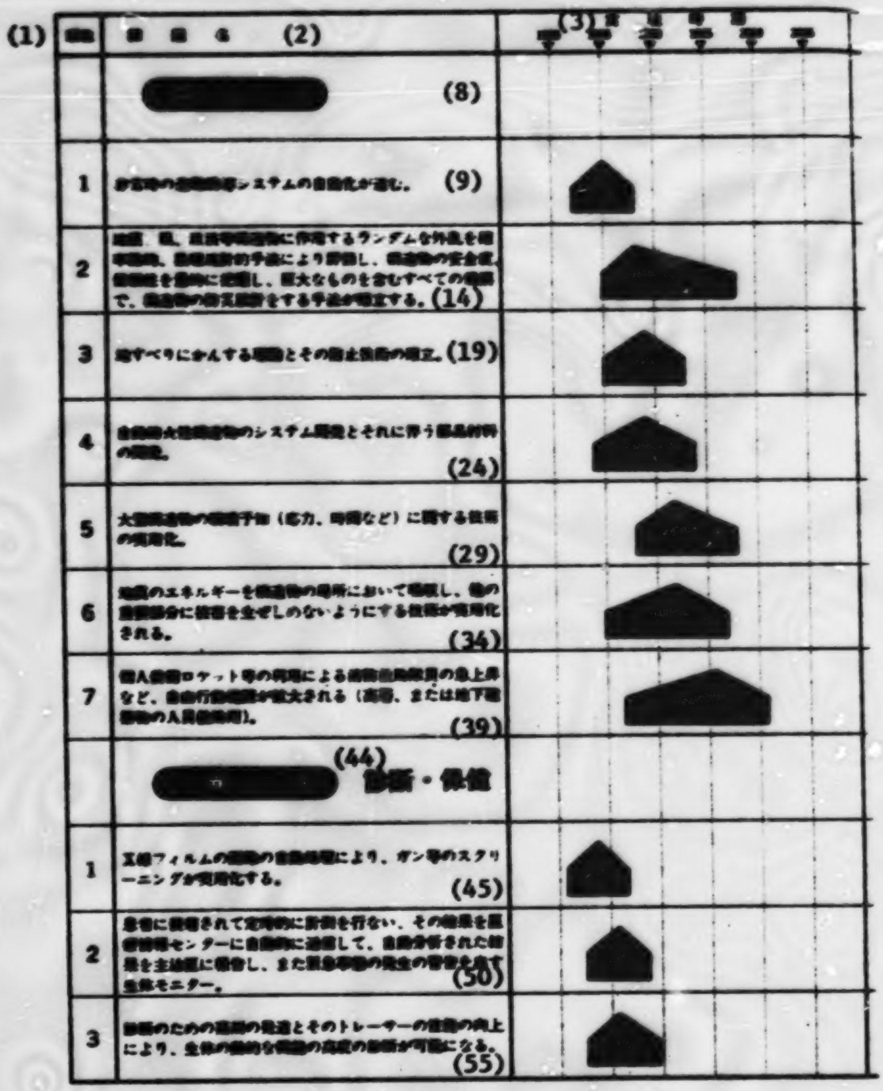
12. (M) liquid helium, superconducting wire, nonmagnetic steel materials (such as CFRP)
(C) liquid helium container
(E) superconducting magnet, low noise fan jet engine, gap detection and control system
(B) superlarge diameter tunnel (on ground or underground)
(Sys) operating control system
The vehicle is lifted by superconducting magnetism inside the tunnel and propelled by jet engine
13. Residential and Urban Environment
14. Bathrooms using mainly plastics, toilets, porch, kitchen and other rooms unitized by simple assembly, disassembly, shifting, and recombination technology becomes practical

[Key continued on following page]

15. (T) fabrication method
    (S) organization, awareness
16. Private
17. Large firms
18. (M) plastic material being main part of composite building material
    (B) functional unit (such as sanitary core)
    (Sys) modular system, unit making up reliable coupling-decoupling system (including distribution wires and pipes), order entry system
19. Industrialization of homes with main construction of metal which is low in cost and yet retains a Japanese atmosphere
20. (T) materials
    (S) awareness
21. Private
22. Large firms
23. (M) composite engineering materials centered on metal materials
    (C) reliable and easy to handle coupling sections, composite engineering construction parts centered on metal materials
    (E) mobile crane of great flexibility and high strength
    (Sys) module system, order entry system, aluminum alloy and highly rust resistant steel, cast iron
24. Parks, blocks, cities, towns, or village units using trash as heat source to provide complete air conditioning (air exchange, cooling, dehumidification)
25. (T) fabrication method
    (S) awareness
26. Government
27. Government
28. (M) heat insulator, corrosion and fire resistant material
    (C) pipe
    (E) large sintering furnace, waste heat utilizing boiler, large absorption refrigerator, heat exchanger, pump, air conditioner for plants or homes, humidity control system
    (Sys) optimum area plan
    Response to lack of trash disposal sites, prevention of atmospheric pollution, energy conservation
29. Synthetic polymeric material for building construction is developed
30. (T) materials
    (S) organization
31. Private
32. Large firms, company groups
33. (M) FRP premixed vat, CFRP premixed vat, MFRP premixed vat, FRP premix which can be readily adjusted for setting time and laid by pump action
    (E) premix casting pump, premixed mat retention tools, temporary installation machine
    Perform FRP premix just as concrete casting
34. Roadways and sewers will be constructed at 1/3 the time required at the present through high speed mechanization and maximum use of prefab construction
35. (T) fabrication method
    (S) organization
36. Private
37. Company groups, government

[Key continued on following page]

38. (M) fast strengthening cement
(C) multiple, standardized, and open PC prefab parts; hydraulic equipment
(E) high performance ditching machine (such as for high speed shield ditching), high performance paving machine, mobile crane of high flexibility and strength
39. A person's psychological, subjective, and physiological reactions to building material are measured, and material design is based on such results
40. (T) theory
(S) awareness
41. University
42. Government
43. (E) computer, multireaction measurement facility
(Sys) main component analysis, factor analysis, construction test of measurement model, improvement, psychological study of reaction relationships based on sample piece and overall parts construction
44. Foamed steel, foamed iron thermally insulating walls and pillar materials become practical
45. (T) fabrication method
(S) organization
46. Private
47. Large firms
48. (M) foamed iron and steel material, foaming agents for iron and steel
(C) multifunctional construction material with foamed iron and steel core
(E) electric saw for cutting foamed iron and steel
On-site fabrication just as with wood becomes possible
49. Development of cement which uses soil as construction material
50. (T) material
(S) organization
51. Private
52. Large firms
53. (M) suitable cement development, suitable formulation agent (dispersion agent, solidification agent) development
(E) mixer development, concrete pump development
The present ones are too high in cost.
Cheaper models will be more popular.
54. Technology is developed to produce emulsion concrete at a price on par with ordinary concrete
55. (T) materials
(S) organization
56. Private
57. Large firms
58. (M) development of suitable polymers and monomers, development of suitable cement
(E) development of mixers, development of concrete pump, PC concrete production facility
59. Use of robots for building construction and parts linkage operations
60. (T) components
(S) organization, awareness
61. Private
62. Large firms
63. (E) intelligent robot (with sight and touch), microcomputer
(Sys) computer cascade system, robot group control system, communication system (wireless), easy remote control of high elevation operations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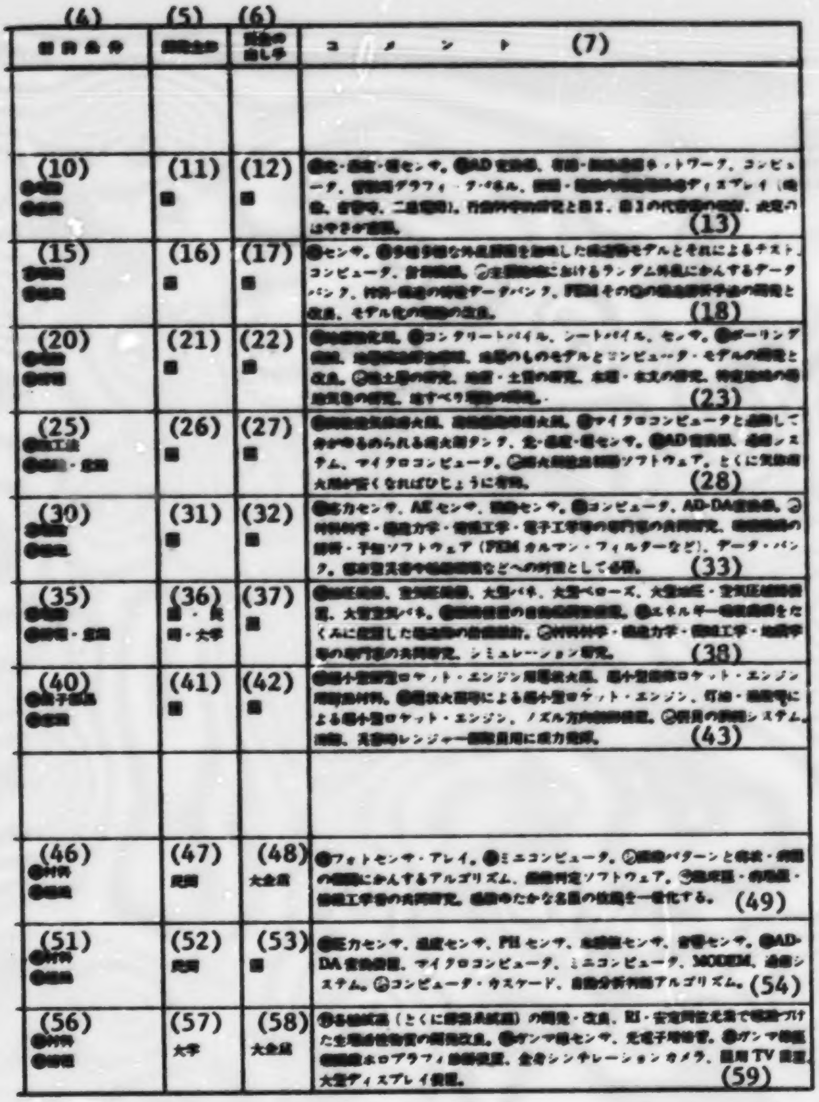
1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Disaster Prevention
9. Promote automation of escape guidance system at time of disaster
10. (T) theory
    (S) awareness
11. Government
12. Government



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(51)	(52) 民間	(53)	(54)
(56)	(57) 大学	(58) 大企業	(59)

13. (C) light, temperature, and smoke sensor
    (E) AD exchange, landline and radio communication network, computer, graphic panel for control use, escape guide display at street corners and in facilities (audio and visual, back-up power source). Research on movement science, study of 2d and 3d alternate plans, and the speed of decision-making is important.
14. Evaluate random disturbances such as earthquakes, wind, and waves which affect buildings through probability theory and numerical statistic methods, know the degrees of safety and reliability of buildings, and establish disaster prevention plans for building including very major scale disasters
15. (T) theory
    (S) organization
16. Government
17. Government

[Key continued on following page]

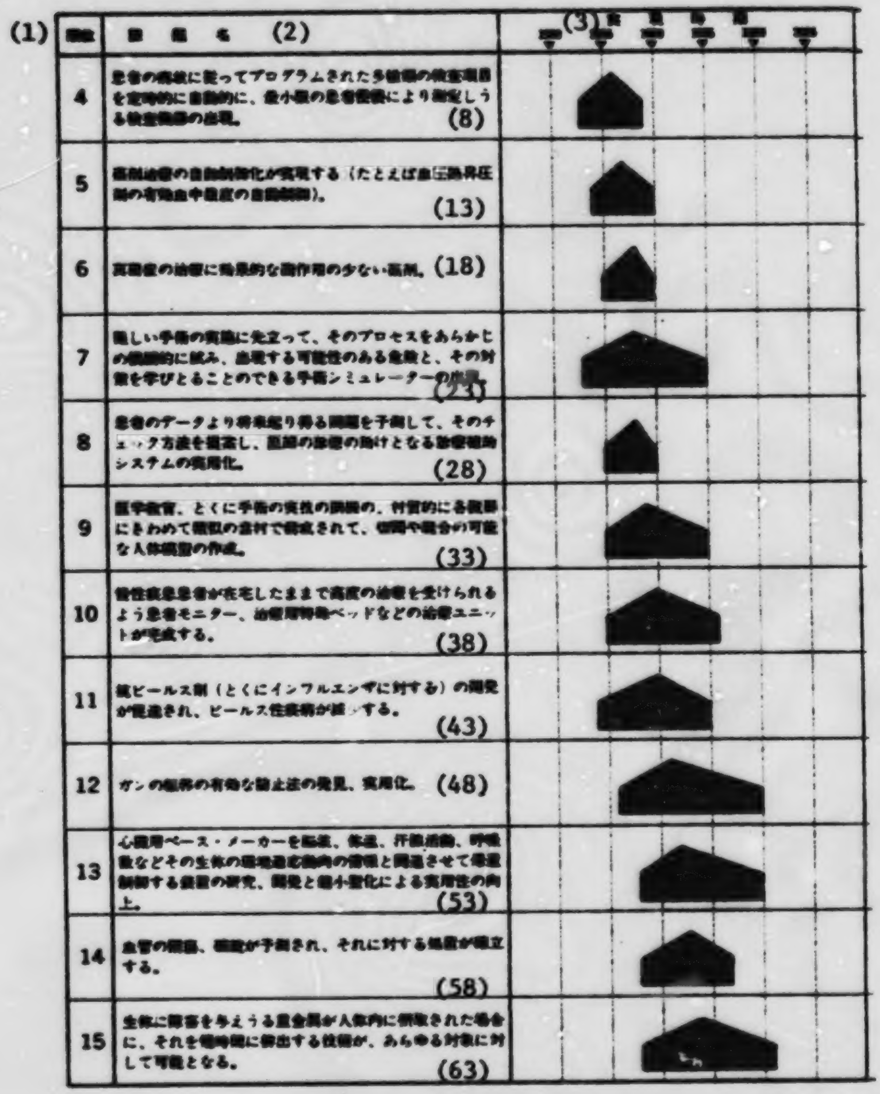
18. (C) sensors
(E) model structures which are designed to cope with various types of external factors and the associated tests, computer, measurement equipment
(Sys) data bank on random disturbances which can affect principal regions, materials and structural characteristics data bank, development and improvement of FEM and other structural analysis methods, improvement in model making theory
19. Establishment of theory and prevention technology against landslides
20. (T) theory
(S) information
21. Government
22. Government
23. (M) foundation reinforcing agent
(C) concrete pile, sheet pile, sensor
(E) boring machine, strata structure search machine, development and improvement of ground strata model and computer model
(Sys) research on clay layer, research on geology and soil research on hydraulic and hydrology, research on local meteorology of specific district, development of landslide theory
24. Development of automatic fire extinguishing system for buildings and the accompanying development of parts and materials
25. (T) fabrication method
(S) organization, awareness
26. Government
27. Government
28. (M) high performance fire extinguisher gas, high performance fire extinguisher foam
(C) valve regulated by microcomputer for fire extinguisher tank; light, temperature, and smoke sensor
(E) AD converter, communication system, microcomputer
(Sys) software for judging when to discharge firefighting agent
This will be particularly effective when gaseous firefighting agents become cheaper
29. Develop technology related to advance knowledge of the breakdown properties (stress, time, etc.) of large structures
30. (T) theory
(S) organization
31. Government
32. Government
33. (C) stress sensor, AE sensor, vibration sensor
(E) computer, AD-DA transducer
(Sys) material science, structural dynamics, information engineering, and electronic engineering type special joint research; analysis and prediction, software on destructive mechanisms (FEM Carmen filter, etc.), data bank
Necessary as countermeasure against urban disaster or shipboard disaster
34. Develop technology by which earthquake energy is absorbed locally so that it is not capable of inflicting damage on other important parts of a building
35. (T) theory
(S) information, awareness
36. Government-private-university
37. Government

[Key continued on following page]

38. (C) hydraulic equipment, pneumatic equipment, large spring, large bellows, large hydraulic-pneumatic buffer device, large air spring
(E) automatic fine control of buffer facility
(B) design of structures skillfully incorporating energy absorbing mechanisms
(Sys) material science, structural dynamics, mechanical engineering, and earthquake engineering specialties joint research; simulations research
39. Use of individual [strap-on] rockets to enable quick delivery of personnel and equipment to needed spots and expand the range of free movement (for rescue from high rise buildings or underground structures)
40. (T) components
(S) awareness
41. Government
42. Government
43. (M) layer type fuel for supersmall solid fuel rocket engine, heat resistant material for supersmall liquid fuel rocket engine
(E) supersmall rocket engine using layer type fuel, supersmall rocket engine using kerosene and liquid oxygen, nozzle directional control device
(Sys) personnel training system
Emphasis on disaster ranger brigade training
44. Medical, Welfare -- Diagnosis, Health
45. Automated processing of X-ray film to enable better screening for cancer, etc.
46. (T) materials
(S) organization
47. Private
48. Large firms
49. (C) photo sensor array
(E) minicomputer
(Sys) image pattern and disease-medical history correlation algorithm, image judging software
(Ser) joint research by clinical, physician, pathological physician, and information engineer
Make available rich experiences of famed physicians
50. Body monitor installed on patient which measures desired body function values at stated times, automatically transmits the data to the medical information center, reports the results of automated analysis to the physician in charge, and sounds an alarm in case of emergency
51. (T) material
(S) organization
52. Private
53. Government
54. (C) pressure sensor, temperature sensor, pH sensor, blood sugar sensor, sound sensor
(E) AD-DA transducer, microcomputer, minicomputer, MODEM, communication system
(Sys) computer cascade, automated analysis judgment algorithm
55. Advances in drugs used for diagnosis and improvements in their tracer capabilities make possible high level dynamic diagnosis of the body
56. (T) materials
(S) information
57. University
58. Large firms

[Key continued on following page]

59. (M) development and improvement of various reagents (particularly oxygen family reagents), development and improvement of physiologically active materials tagged with RI and stable isotopes
(C) gamma ray sensor, photoelectronic amplifier
(E) gamma ray holographic diagnostic facility, whole body scintillation camera, medical TV, large display device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Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Inspection items of various nature programmed according to the patient's needs are checked at stated intervals automatically with minimum patient discomfort through a patient test machine that will be developed
9. (T) theory, fabrication method, components
   (S) organization
10. Private
11. Large firms

(4) [illegible]	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
Ⓣ[illegible]・[illegible]・電子部品 (9) Ⓢ[illegible]	(10) 民間	(11) 大企業	ⒺCT のような患者[illegible]の少ない[illegible]の開発・多様化（とくに超音波系）、マイクロコンピュータ、ミニコンピュータ。Ⓢ[illegible]ソフトウェア、[illegible]ソフトウェア、[illegible]分析[illegible]ソフトウェア。[illegible]のひじょうに[illegible]の[illegible]。 (12)
(14) Ⓣ[illegible] Ⓢ[illegible]	(15) 大学	(16) 大企業	Ⓔ[illegible]の[illegible]計測、[illegible]での[illegible]計測。Ⓔマイクロコンピュータ、フィードバック[illegible]装置。Ⓢアルゴリズム、生理学・[illegible]学・[illegible]学と自動制御工学・[illegible]工学との共同研究。人工すい[illegible]などとも共通する。 (17)
(19) Ⓣ[illegible] Ⓢ[illegible]	(20) 民間	(21) 大企業	(22) Ⓔ[illegible]に有効で副作用の少ない[illegible]、体内で効力を持続する[illegible]開発。真菌症（[illegible]などにかびが生える）は、現在ひじょうに治療の難しい病気。
(24) Ⓣ[illegible] Ⓢ[illegible]	(25) 大学	(26) 国	(27) Ⓔコンピュータ、インテリジェント・ターミナル。Ⓢ[illegible]・[illegible]・[illegible]・[illegible]・[illegible]・[illegible]工学専門家の共同研究。[illegible]的データバンク（データファイルとソフトウェアをふくむ）。[illegible]。SD型シミュレーション・モデル。
(29) Ⓣ[illegible] Ⓢ[illegible]	(30) 民間・大学	(31) 国	Ⓔコンピュータ、インテリジェント・ターミナル、[illegible]カップリング[illegible]。Ⓢ[illegible]予測ソフトウェア（シミュレーション、SD タイプなど）、[illegible]システム（データバンク、ソフトウェア）、[illegible]アルゴリズム、[illegible]システム。 (32)
(34) Ⓣ[illegible] Ⓢ[illegible]	(35) 大学	(36) 国	Ⓔ[illegible]の[illegible]、[illegible]によく[illegible]・[illegible]・[illegible]等をもつ[illegible]高分子材料やそれをベースにした[illegible]の[illegible]。Ⓔ[illegible]・[illegible]・[illegible]等を[illegible]させた人[illegible]の[illegible]改良。[illegible]として[illegible]シリコン・ゴムなどが[illegible]されている。 (37)
(39) Ⓣ[illegible] Ⓢ[illegible]	(40) 民間	(41) 国	Ⓔ[illegible]センサ、[illegible]センサ。Ⓔ[illegible]モニター（[illegible]で[illegible]と[illegible]する）、[illegible]装置、マイクロコンピュータ、MODEM、[illegible]テント・[illegible]つき[illegible]ベッド。Ⓢ[illegible]・生理学[illegible]・電子工学者・[illegible]等の共同研究。 (42)
(44) Ⓣ[illegible] Ⓢ[illegible]	(45) 民間	(46) 大企業	Ⓔビールスをよく[illegible]かビールスに対する[illegible]の[illegible]力をつよめ、かつ副作用がないか少ない物質の開発・改良、体内で効力を持続させる[illegible]の開発・改良。インターフェロンなどが出はじめたが、これからの[illegible]れる。 (47)
(49) Ⓣ[illegible] Ⓢ[illegible]	(50) 大学	(51) 国	Ⓔ有効で副作用のない（または少ない）抗ガン剤・[illegible]ガン剤・[illegible]の開発改良。Ⓔ中性子[illegible]装置、パイ中間子[illegible]装置。Ⓢ生理学・[illegible]学・[illegible]化学・[illegible]学等の進歩。 (52)
(54) Ⓣ電子部品 Ⓢ[illegible]	(55) 大学	(56) 国	Ⓔ[illegible]・耐久性・経時劣化少ない各種センサ、超小型電池。Ⓔ超小型 AD-DA 変換装置、超小型マイクロコンピュータ、超小型フィードバック[illegible]式ペースメーカー。Ⓢ[illegible]学者・[illegible]学者・[illegible]・電子工学者等の共同研究。[illegible]の[illegible]および[illegible]パラメータと心[illegible]の[illegible]の研究。 (57)
(59) Ⓣ[illegible] Ⓢ[illegible]・[illegible]	(60) 大学	(61) 国	Ⓔ[illegible]、血管[illegible]剤、血[illegible]止剤。Ⓔコンピュータライズド・トモグラフィ、マイクロサージェリー[illegible]、マイクロサージェリー[illegible]（レーザメスその他）。[illegible]としては[illegible]外科手術などが望まれよう。 (62)
(64) Ⓣ[illegible] Ⓢ[illegible]	(65) 大学	(66) 国	Ⓔ[illegible]金属を[illegible]に[illegible]し、それ自体は無害なキレート[illegible]の[illegible]。Ⓢ[illegible]・[illegible]など適当な[illegible]方法の[illegible]改良。効力高く無害なキレート物質の開発と[illegible]が鍵の手か。 (67)

12. (E) development and multiple use of examination unit such as CT with little invasion into patient (particularly ultrasonic family), microcomputer, minicomputer
    (Sys) software for necessary examination items, automated examination software, software for analysis of examination results, reduce pain associated with brain surgery and nerve treatment
13. Appearance of automated control of drug therapy (such as automatic control of effective concentration in blood keyed to rise or fall in patient's blood pressure)
14. (T) theory
    (S) information
15. University
16. Large firms

[Key continued on following page]

17. (C) instrument for blood concentration determination of certain items, instrument for measurement of concentrations of certain substances in certain tissues
(E) microcomputer, feedback control automated reagent injection device
(Sys) algorithm, joint research by physiologist, pathologist, pharmacologist, and automated control engineer-mechanical engineer
Artificial spleen technology also can be developed
18. Drugs with minimum side effects which are effective for mycosis
19. (T) materials
(S) organization
20. Private
21. Large firms
22. (M) agent effective against mycobacteria disease with minimum side effects, development of manufacturing method which maintains effectiveness in body
Mycobacteria diseases (such as fungal growth in lung) are presently very difficult to treat
23. The surgical process is rehearsed prior to a difficult surgery to seek out any difficulties which might be encountered and devise countermeasures thanks to appearance of a surgery simulator
24. (T) materials
(S) information
25. University
26. Government
27. (E) computer, intelligent terminal
(Sys) joint research by specialists from physiology, pathology, autopsy, clinical treatment, and information engineer, tiered type data bank (including data file and software), multiple tiered SD simulation model
28. Prediction of problems which might occur in the future based on a patient's data, device check measures, and provide help to the physician in the diagnostic aid that will be developed
29. (T) theory
(S) information
30. Private, university
31. Government
32. (E) computer, intelligent terminal, audio coupling device
(Sys) sickness state prediction software (such as simulation, SD type), symptoms and cause information search system (data bank, software), diagnostic algorithm, communication system
33. Organ facsimiles very close to the actual organs are used for medical training particularly in surgical training to enable cutting and suturing practice
34. (T) materials
(S) information
35. University
36. Government
37. (M) search and development of composite material based on organic polymers to simulate feel, resistive feeling, strength, etc. of various body organs and tissues
(E) development and improvement of body models fabricated by combination of membrane structure, fiber structure, and foam structures
Silicon gum is one of materials being studied as base material
38. Completion of a treatment unit including a special bed and patient monitor by which a chronic patient can receive high level treatment

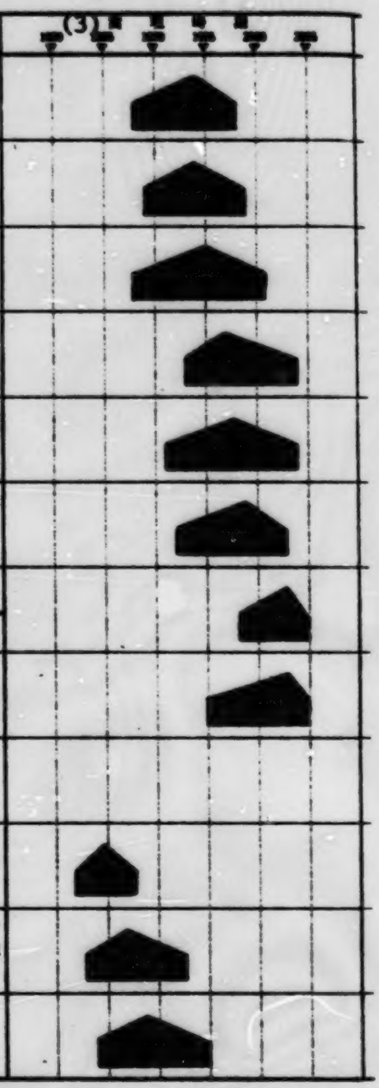
[Key continued on following page]

39. (T) components
    (S) awareness
40. Private
41. Government
42. (C) general symptoms detection sensor, special area symptoms detection sensor
    (E) patient monitor (connection to hospital through telephone), continuous body fluids analyzer, microcomputer, MODEM, automatic oxygen tent, and automated transfusion unit equipped multifunctional bed
    (Sys) joint research by pathologist, physiologists, electronic engineer, and mechanical engineer
43. Development of antiviral agents (particularly against influenza) is promoted, and viral diseases are reduced
44. (T) theory
    (S) information
45. Private
46. Large firms
47. (M) development and improvement of agent which kills virus or enhances resistance of body tissues against virus with little side effects, development and improvement of manufacturing method which maintains its effect within the body
    Interferon has made its appearance, and more developments are awaited.
48. Discovery and practical application of method to prevent carcinogenic metastasis
49. (T) theory
    (S) organization
50. University
51. Government
52. (M) development and improvement of anticarcinogen agent, cancer controlling agent, and tissue activation agents which are effective and of low side effects (or none)
    (E) neutron irradiation facility, pi meson irradiation facility
    (Sys) advances in physiology, pathology, cytogenetics, pharmacology
53. Associate pacemaker function with information on brain waves, body temperature, sweat gland activities, and respiration rate in research on devices to effect feedback control and to miniaturize the pacemaker
54. (T) components
    (S) information
55. University
56. Government
57. (C) high performance long lasting, and small timewise deterioration sensors; super small battery
    (E) super small AD-DA transducer, super small microcomputer, super small feedback control pacemaker
    (Sys) joint research by physiologist, pathologist, clinical physician, and electronic engineer; elucidation of relationship between output phenomena and overall parameters
58. Blockages or rupture of vascular tissue is predicted, and countermeasures are established
59. (T) theory
    (S) information, organization
60. University
61. Government

[Key continued on following page]

62. (M) vascular expander agent, vascular reinforcing agent, anti-blood clotting agent
(E) computerized tomography, microscope for microsurgery (laser scalpel)
Microsurgery may be used as treatment method.
63. When heavy metals injurious to the body are taken up, technology to extract them in short order is developed which is applicable to all kinds of such substances
64. (T) theory
(S) information
65. University
66. Government
67. (M) development of chelating resin family material to reliably entrap the desired heavy metal while the chelate remains as nontoxic material
(Sys) development and improvement of suitable methods of drug administration such as injection or mini-drip infusion
Development of effective and nontoxic chelate and production technology.

(1) 番号	課題名 (2)
16	人工腎臓の体内埋込み。 (8)
17	pharmacokinetics からの情報が増加し、医薬投与量にかんする一般則が発見され、個体差検出法が実用化される。 (13)
18	生体成分の消長と疾病との関連が明確に把握される。 (18)
19	移植免疫の機構解明と拒絶反応なき臓器移植の確立。 (23)
20	完全に人体組織になじみ、拒絶反応の起らぬ人工臓器ができる。 (28)
21	神経細胞の接合が自由に行なわれる。 (33)
22	寿命および老化現象の本質解明と科学的長寿法の実用化。 (38)
23	遺伝科学の研究の成果をもとにして、特定遺伝子もしくは染色体の人工制御（修飾）により遺伝病の治療が可能になる。 (43)
	社会復帰・福祉 (48)
1	人間の一人一人の運動能力が検査機器と体力測定により測定されるようになり、スポーツの適性が合理的に判断される。 (49)
2	聴力曲線にあわせた補聴器の実用化（現在のものはただ全スペクトルにわたって音を増幅している。可聴欠損域を調べて、それを補うような補聴器）。 (54)
3	人工角膜の実用化。 (59)



Key:

1. No.
2. Subject
3. Materialization period
4. Restricting conditions
5. Main developing body
6. Source of funding
7. Comments
8. Artificial kidney implant
9. (T) materials
   (S) organization
10. University
11. Government

(4) [illegible]	(5) [illegible]	(6) [illegible]	コ メ ン ト (7)
(9) [illegible] [illegible]	(10) 大学	(11) [illegible]	[illegible](半透膜、マイクロカプセル入り活性炭など)、吸着モジュール逆洗用[illegible]。[illegible]小型吸着モジュール(半透膜式、活性炭式など)、逆洗用チューブ引出し用シャント。[illegible]吸着モジュール逆洗式超小型体内[illegible]人工腎臓。[illegible]サービス。 (12)
(14) [illegible] [illegible]	(15) 大学	(16) [illegible]	[illegible]多チャンネル[illegible]・ミニコンピュータ等を結合した[illegible]の開発改良。[illegible] pharmacokinetics の進歩、[illegible]学者・[illegible]学者・[illegible]学者・臨床医の共同研究。 (17)
(19) [illegible] [illegible]	(20) 大学	(21) [illegible]	[illegible]多チャンネル生化学[illegible]装置、コンピュータ。[illegible]生理学・病理学・臨床医等の共同研究。[illegible]。[illegible]は非常に難しいので、大がかりな共同研究が必要。 (22)
(24) [illegible] [illegible]	(25) 大学	(26) [illegible]	(27) [illegible]作用なく[illegible]な効力をもつ[illegible]の開発・改良。[illegible]生理学者・生化学者・[illegible]学者の共同研究。
(29) [illegible] [illegible]	(30) 大学	(31) [illegible]	[illegible]反応をおこさぬ[illegible]の開発・改良、[illegible]反応をおこさぬ半合成素材の開発・改良（生体材料を分解、再合成したもの）。[illegible]反応・[illegible]・[illegible]等をおこさぬ[illegible]・[illegible]の開発改良。[illegible]生化学者・生理学者・病理学者・化学者・臨床医等の共同研究。 (32)
(34) [illegible] [illegible]・[illegible]	(35) 大学	(36) [illegible]	[illegible]人工[illegible]（[illegible]、[illegible]高分子[illegible]など）。[illegible]の特定化[illegible]装置、[illegible]手術装置。マイクロサージェリー（[illegible]小外科手術）の進歩が決め手。 (37)
(39) [illegible] [illegible]	(40) 大学	(41) [illegible]	(42) [illegible]の開発・改良。[illegible]現象の研究、[illegible]の形成・[illegible]現象の研究。
(44) [illegible] [illegible]	(45) 外国	(46) [illegible]	[illegible]な効力をもち副作用のない遺伝子作用物質の開発・改良。[illegible]遺伝子作用物質の体内への注入装置。[illegible]・[illegible]の[illegible]の確立、遺伝学者・分子生物学者・生理学者・[illegible]学者・病理学者・臨床医などの共同研究。[illegible]などの先天的な[illegible]または欠損に起因する[illegible]の治療などに威力発揮。(47)
(50) [illegible] [illegible]	(51) 民間	(52) [illegible]	[illegible]の身体に装着される各種センサ・発信装置。[illegible]、[illegible]力[illegible]、[illegible]、その他の体育生理[illegible]、ミニコンピュータ、通信システム。[illegible]ソフトウェア。 (53)
(55) [illegible]子部品 [illegible]	(56) 民間	(57) 中小企業・大企業	(58) [illegible]の個人別特性を調べる[illegible]の開発・改良。個人別特性に応じた[illegible]を容易に設計し製作できる生産システム。
(60) [illegible] [illegible]	(61) 大学	(62) [illegible]	(63) [illegible]がよく、生体になじみやすい高分子材料の開発・改良（たとえば[illegible] MMA [illegible]など）。

12. (M) high performance waste adsorber (activated carbon with microcapsule, semipermeable membrane), adsorption module backwash solution
    (C) super small adsorption module (semipermeable membrane type, activated carbon type), shunt for pulling out backwash tube
    (E) adsorption module backwash type super small body implant artificial kidney
    (Ser) periodic inspection and maintenance service
13. Increase in pharmacokinetics information leads to discovery of a general rule for dosage, and a method for detecting individual differences is developed
14. (T) theory
    (S) information
15. University
16. Government

[Key continued on following page]

17. (E) multichannel body fluids analyzer, minicomputer linked together in a drug dose differential between individuals detection unit that is developed
(Sys) advances in pharmacokinetics, joint research by pharmacologists, physiologists, pathologist, clinical physician
18. Relationship between ups and downs in body components and pathological condition is clearly established
19. (T) theory
(S) organization
20. University
21. Government
22. (E) multichannel biochemical automated analyzer, computer
(Sys) joint research by physiology, pathology, clinical medicine; multiple variable elucidation method
The elucidation of correlation and factor relationship is very difficult, and large scale joint research effort is necessary
23. Establishment of mechanistic explanation of transplant immunity and organ transplant without rejection reaction
24. (T) theory
(S) manpower
25. University
26. Government
27. (M) development and improvement of rejection reaction prevention agent with great effect and no side effects
(Sys) joint research by physiologists, biochemists, and immunologists
28. Artificial organs are developed which are completely compatible with body tissue and which cause no reject reaction
29. (T) materials
(S) information
30. University
31. Government
32. (M) development and improvement of synthetic materials which do not cause reject reaction, development and improvement of semisynthetic materials which do not cause reject reaction (body materials are broken down and resynthesized)
(C) development and improvement of tissue and activation technology that does not cause reject reaction, blood clotting, and blood stoppage
(Sys) joint research by biochemists, physiologists, pathologists, chemists, and clinical physicians
33. Fusion of nerve tissues can be conducted freely
34. (T) theory
(S) information, organization
35. University
36. Government
37. (M) artificial nerves (fine metal wires, conducting polymeric wires)
(E) specific nerve identification device for nerves and nerve tissue, high magnification microscope equipped surgical unit
Microsurgery (very small surgery) advances are deciding factor
38. True elucidation of life and aging phenomenon and a method of scientific prolongation of life becomes practical
39. (T) theory
(S) organization
40. University
41. Government

[Key continued on following page]

42. (M) development and improvement of anticell toxic serum
(Sys) research on immuno phenomena, research on cell toxic formation and accumulation phenomenon
43. The results of genetic research make possible treatment of genetic diseases through special genes or artificial control (doctoring) of chromosomes
44. (T) theory
(S) awareness
45. Foreign country
46. Government
47. (M) development and improvement of genetic effect material that is reliable and has no side effects
(E) genetic effect material injection device
(Sys) establishment of regulatory and observatory system training, joint research by geneticist, molecular biologist, physiologist, pharmacologist, pathologist, and clinical physician
Direct emphasis on treatment of difficult diseases such as natural presence or lack of special enzymes
48. Social Rehabilitation, Welfare
49. Individual motor capabilities can be measured with examination equipment, and a person's athletic capabilities can be rationally judged
50. (T) theory
(S) information
51. Private
52. Government
53. (C) various sensors and signal generating devices installed on body of patient
(E) nerve reflex test unit, various muscle test equipment, metabolic test during exercise unit, other body physiology test units, minicomputer, communication system
(Sys) software for body physiology judging
54. Development of a hearing aid fitted to the hearing strength (the present hearing aids amplify sounds over the entire spectrum. Hearing aids which are tailored to supplement the hearing deficiencies that are first established)
55. (T) components
(S) organization
56. Private
57. Medium and small firms, large firms
58. (E) development and improvement of examining individual hearing properties, production system which can readily design and produce hearing aids according to individual needs
59. Practical development of artificial cornea
60. (T) materials
(S) information
61. University
62. Government
63. (M) development and improvement of polymeric material with good optical properties and compatible with the body (such as hydrophilic MMA resin)

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TOMORROW'S INDUSTRY WILL DIFFER IN THIS MANNER--PREDICTION OF MAIN INDUSTRIAL TECHNOLOGIES AFTER 1980

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 191-193

[Text] Seven Major Industries

As mentioned before, this present survey of the Research Institute of Industrial Materials involved three panels which provided information on the national economy and overall industry, and the following analysis was made with respect to the developments expected according to different areas during the post-1980 era.

The economic, social, and international environments, needs, and restricting conditions enveloping the seven major industrial areas including automobile, transport equipment other than automobiles, electronics, information, chemical industry, steel industry, and fiber-textile-food-household goods were examined in the light of how they will change, what changes will take place in the international competitive environment, and how the demand structures of the different industries will change as seen from the standpoint of the efforts and capabilities of Japanese industry to react to these situations. The manner by which each industry resolves this situation and opens up its action areas to grow are the technology development subjects that need to be established.

Because of space limitations, it was not possible to introduce all the data, but if the data offered by the second and third panels are included according to the characteristics of each industrial section and business, the development becomes considerably different. At the same time, the seven areas listed above were taken up here, but it is needless to say that a similar treatment can be made on a number of other areas.

The first item in this text is the setting up of a conceptual model on "Environmental factors affecting each industry and the technological countermeasures which each industry and business can adopt" to simplify the understanding of the data.

It is only natural that the data will differ considerably between different industrial areas. For example, the basic material production industries such as iron and steel and chemicals are the principal consumers of energy and basic raw materials and will be the most important factors in the economic environment because of the rise in cost of basic materials such as oil, raw material coal, and natural gas and all other energy sources; the shift from a buyer's market of the past to a seller's market; and the increasing cost of electric power.

In another direction, there is the problem of an aging labor force and the difficulty of obtaining young labor and the aging society in the area of the automobile industry and other transport machine industries such as airplane, ships, and railroads. Japan has a high wage scale, and head to head confrontation with developing and partially developed countries has to be avoided. There are some residual effects from World War II such as in the area of airplanes, and the weak manpower, information, and financial stock and bases are important sore subjects.

The electronics and information industries are beset with the high cost of electric power, and their late appearance on the scene leaves them with a handicap when confronted with the most advanced firms such as IBM. High purity silicon which is a key material of the electronic industry is a product which consumes more electric power than the so-called "clod of electricity" that is aluminum, and the fact that Japan's high purity silicon is rapidly losing its competitive edge is something that needs to be noted carefully.

The social environment also differs greatly by industry. For example, the environmental regulations and siting problems are major problems of the materials industries while the automobile industry faces stiff taxes and assessments not only on the automobile itself but the fuel as well. The electronic and information industries suffer from the lack of a very large and technologically high level demand market. At the same time, they do not enjoy spinoffs from military electronics and information technologies. As far as the aircraft industry is concerned, there is great reluctance on the part of both government and private sources to provide funding for research and development. Safety problems and hygienic problems arising from base materials, additives, and structures are major factors in the food, household goods, and textile industries.

Competition With Developing Countries

Next, the international competitive environment. Japan must import the greater part of its raw materials, food, and energy resources. In other words, it is a sophisticated manufacturing trade country whose international competitive environment with regard to its major products is an important problem. The electronics industry, food, household goods, and textile industries have lost their competitive edge in the matter of ordinary grade products, and it is possible that the future will also see a loss in the area of middle class goods.

This trend in the environment must be followed carefully as the quality of the products has to be shifted to middle and upper class levels. The United States and West Germany possess great competitive strength in the area of high class products, and Japan must forever be developing new products and striving to rationalize its production technology.

The steel industry is expected to retain a superiority through its superior production technology through the 80's. While it may be so, it will then be facing competition from the Middle and Near East countries where reducing gas is available almost without cost, and direct steelmaking plants are expected to spring up in these countries along with competition from new plants in Korea, Taiwan, Brazil, and Iran to name a few potential competitors.

Since the factors mentioned above and external and internal needs are all tangled together, there must be continual attention directed to changes in demand structure in the different industries from here on. For example, the electronic and information technologies are extended deeply into all facets of living, society, and industry, and it is thought this trend will continue even more from here on. Up to the present time Japan has been exploiting an overwhelming superiority in the area of the world's consumer electronic equipment, and the rate of electronic equipment use by its people is the highest in the world. This rate, however, is approaching saturation. The future will have to see attention directed at efforts on the part of the production of electronic and information equipment for the domestic, leading countries, partially developed countries, and emerging countries markets along with efforts at new developments and improvement in production technology.

Where aircraft is concerned, Japan will not be able to compete with the United States and the Soviet Union in the matter of large high speed transport planes, and what is left open for it include STOL planes, medium class transport plane with great toughness for operating from irregular landing fields. Also in the possible exploitation area is the seaplane which requires no landing field. These possibilities make up a considerable area for exploitation.

There is already a loss of competitive strength in the production of middle and ordinary class products where railroad rolling stock and ships are concerned to emerging and partially developed countries, and there is stagnation. There is need from here on to shift attention to high class products (such as LNG tankers, high speed container vessels, work ships, plant ships, and semisubmersible ships; new interurban traffic systems; and high speed railroads including a second Shinkansen [Bullet train]).

The textile industry has been one which piled up a remarkable record of success in the restoration of Japan's postwar production and Japan's advance to a leading status. In the course of this development, it took over the role of top dog in the world's textile industry from the Lancashire textile industry of the United Kingdom, but this industry is now being rapidly overtaken by several Asian countries headed by Korea. Not only is Japan being overtaken in the area of ordinary and middle class fiber and textiles but also in middle class products and fiber raw materials as well. With this in mind, Japan needs to follow a path that will take it from the role of basic supplier of ordinary and middle class goods to a large but limited supplier while possibly becoming a large fashion center. There may be need also to look into heavy duty industrial fibers tied in with domestic and foreign land redevelopment, increased food production, expanded agricultural land, and large volume product transport technology innovations.

Production Technology Is Basic

Japan's industries from here on must engage in multifaceted business and strategies based on their accumulated production technology, business technology, information, and manpower to cope with the changes in the environmental factors, demand structure, and international competitive environment. The siting problem has to be resolved, production of middle and higher class goods must be promoted and commercialization of services such as engineering, software, and knowhow will probably have to be followed. The basis for such efforts will have to be ceaseless improvement and rationalization of production technology. There is need to maintain competitive strength through new construction and development of fabrication technology along with promotion of new products, revolutionary products and services, development of knowhow, and its commercialization aimed at domestic and foreign needs and limiting conditions. In this manner every effort must be made to upgrade industry and thereby contribute to the uplifting of domestic and foreign living, society, and industrial levels.

There is need here to say that many of these technologies are complex system technologies.

An attempt was made based on the technology and industrial structure predictions of this survey to determine what improvements in production technology, innovations, and development of new products will be forthcoming in the post-80 era, assembling data as much as possible within the limited space, and the views on the seven industrial areas cited above are presented here.

First of all, the domestic and foreign conditions of each industrial area are first described after which the outstanding strategic targets for the post-80 age are listed for the necessary technology which were selected from the survey. The figures appended at the end of each technology item are the estimated year when the technology is expected to materialize and commercialize. For example, 89 refers to 1989 while 00 refers to 2000 as the year of materialization.

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AUTOMOBILES

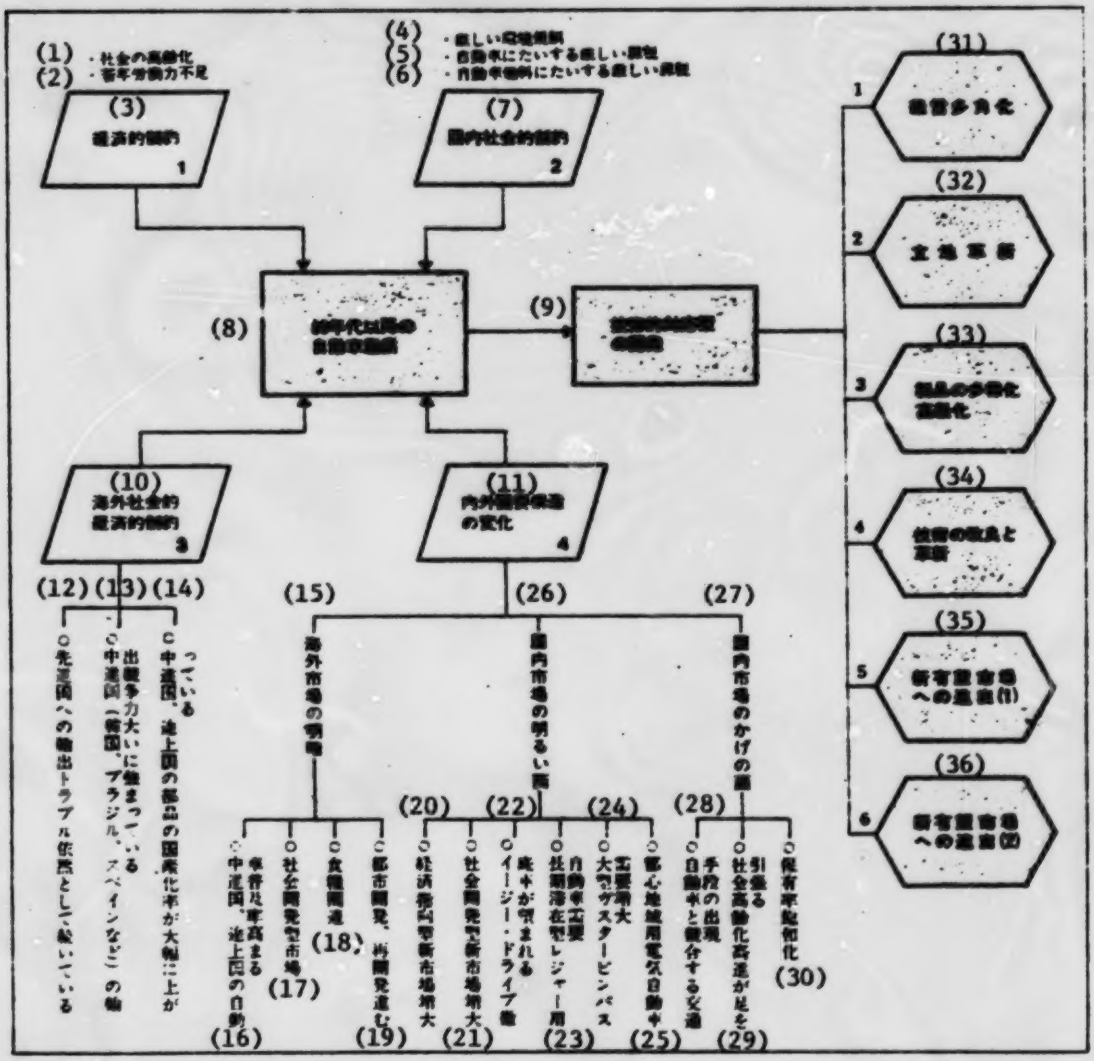
Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 194-196

[Text] To Easy Driving as Countermeasure Against Declining Ownership Rate

As efforts are directed to high degree automation in production technology, there is also need to respond to the increasing trends in taxes and levies being made against automobiles and fuel and the environmental regulations problem.

Export troubles with developed countries will continue as before. At the same time, export competition from developing countries (such as Korea, Brazil, Spain) is increasing, and there are demands that the ratio of domestic parts manufacture on the part of the importing country be increased where KD exports are involved. There is also need for technology aid to other countries including parts, and measures along the lines of joint firms are becoming necessary.

As ownership rate approaches saturation, efforts must be directed at producing easy driving automobiles which the aged, housewives, or physically handicapped can operate. While the developments of urban commuter, low pollution gas turbine vehicle, and electric automobile are topics, efforts to respond to new developments in resources, food, urban development, and urban redevelopment and progress in technology, capital export, homes, agriculture, and construction are assuming new directions.


(1)
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1
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2
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(9)
(10)
海外社会的経済的制約
3
(11)
4
(12)
(13)
(14)
(15)
海外市場の明暗
(16)
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(23)
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(26)
国内市場の明るい面
(27)
国内市場のかげの面
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(29)
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Key:

1. Aging of society
2. Lack of young labor
3. Economic restrictions
4. Strict environmental regulations
5. Heavy taxes on automobiles
6. Severe taxes on automobile fuel
7. Domestic social restrictions
8. Automobile industry in the post-80 era
9. Development of technological countermeasures
10. Overseas social and economic restrictions
11. Changes in domestic and foreign demand structure
12. Export troubles to leading countries continue as before
13. Export competition from developing countries (Korea, Brazil, Spain, etc.) is increasing

14. Domestic production of developing and emerging countries is greatly increasing
15. Bright and dark sides of foreign market
16. High rate of use of automobiles in developing and emerging countries
17. Social development type market
18. Food related
19. Urban development, redevelopment advance
20. Increase in economy directed type new market
21. Increase in social development type new market
22. There is need for fully easy drive type automobile
23. Automobile demand in long term residence leisure activity
24. Increase in demand for large gas turbine bus
25. Electric automobiles for use in city centers
26. Bright side of domestic market
27. Dark side of domestic market
28. Appearance of traffic means to compete with automobile
29. Rapidly aging society puts a damper on automobile market
30. Saturation in ownership rate
31. Business diversification
32. Siting innovations
33. Diversity and high quality of products
34. Improvement and innovations in technology
35. Advances into new promising markets (1)
36. Advances into new promising markets (2)

Possible Technological Countermeasures

1. Business diversification--technology export, engineering penetration [overseas] (taking boomerang effect into consideration), commercialization of the entire highway traffic system (rent, lease, repair and maintenance, automobile sightseeing system and such downstream), and automobile related technology will be promoted for use in homes, boats, agricultural machinery, engineering machinery, aerospace, and production machinery. Accompanying new urban traffic systems will be promoted.

Campsites, fishing rivers and streams, seashore, hunting fields, and field athletics facilities provided in a nature association type family leisure facilities will proliferate. (1987)

Home cleaning (central cleaning system), waste disposal, theft prevention, and automated closing of storm shutters will be handled by installed equipment. (89)

Efficient utilization of land in regions of high population density (such as layer structured artificial land) combined with development of homes of individual charm (combination or fitting together of units of individual and multiple character) become practical. (89)

Sites for capsule homes and mobile homes equipped with electricity, gas, water, waste disposal, and TV antenna are located near cities and in winter resort regions. (91)

Residential structural and provisional units assume open nature, simple crane and other materials and tools rental becomes readily available, and DIY projects are encouraged to lower the cost of homes. (94)

2. Siting revolution—People move to inland areas where land is cheap and more expansive, individual or joint sitings at the seashore.

3. Multiple nature and high quality of products--Easy driving automobiles which housewives, the aged, or physically handicapped can readily operate along with nonpolluting, low polluting, safe, and energy conserving automobiles will be required. Easy drive automobiles will be made possible by the wide use of information technology including microcomputers.

Electric automobile which can travel more than 400 km on a single charge. (83)

Development of low noise large truck. (85)

Practical development of device to prevent automobile collisions and contact. (86)

Development of tires with material and structure that will guard against slips on wet pavement. (87)

Light automobile made from composite plastic and light nonferrous alloy will be developed. (87)

Automobile with structure that absorbs impact and has body chassis capable of large deformation becomes practical. (88)

Automated operation of automobiles on a completely guided mode will become possible on some high speed highways. (91)

Practical development of automobile engine using hydrogen as fuel. (93)

Practical development of optimum interurban traffic control system (including automated guidance automobile highway). (94)

4. Improvement and innovation in automobile production technology and related technology--Since factors disadvantageous to competition increase, production technology is converted to higher levels, and lowering the profit point becomes important. At the same time, design technology and automobile related service technology need to be improved and stuffed with new innovations.

Welding flaws are detected automatically in a feedback system as the welding processes of a completely automated welder become practical. (86)

Development of automated assembly line which can assemble various similar assembly products on a single line. (87)

Built-to-order flow production mode is established through the introduction of a computer system which receives orders, designs, produces, and sells. (87)

A number of fabrication methods (cutting fabrication, discharge fabrication, welding, torch cutting, plastic fabrication, casting, etc.) will be group controlled on an automated fabrication line. (88)

Development of automated assembly line consisting of automated assembly equipment with learning capabilities for multiple variety small volume production industry. (88)

Advances in simulation technology eliminate the need for large model experiments in the design of ships and airplanes. (90)

Development of production technology of machines with automatic replacement capability as parts become worn or deteriorate (traveler, picker, etc.). (93)

Automated lines are made up of machines with self-repair capability. (98)

5. Expansion into new promising markets (1)--Living customs change, and living sites become more removed while leisure time increases and lengthens. At the same time, environmental, waste disposal, and medical type social needs increase making necessary automobiles or transport machines to cope with the needs and thereby opening up a promising market.

System to provide periodic visiting and bathing service for very old or physically disabled. (84)

Development of district health diagnostic system consisting of vehicle equipped with diagnostic equipment and a district diagnostic center to cater to housewives, aged, farming and fishing people, and stores type self-employed living in high sickness districts. (87)

Leisure facilities where nature oriented recreation and teamwork between people type outdoor recreation are promoted become widely used. (88)

Development of bus traffic system using high speed gas turbine bus for interurban traffic and traffic to tourist spots. (90)

Development of high speed traffic system makes possible convenient, pleasant, and commutable bed town living at distances roughly 3 times farther away from the urban center than at present (100 km for Tokyo). (92)

Electric automobiles begin to make up a large fraction of the urban rental cars. (92)

Automobile traffic over Asia, Europe, Near and Far East, and Africa Highway (when China opens its doors wider). (95)

6. Expansion into new promising markets (2)--In the future Japan must expand its agriculture to the highlands and reclaimed land and conduct large scale agriculture. Slum areas must be razed and converted to convenient and livable areas through so-called urban development and redevelopment which must be promoted. Traffic and distribution must be maintained even in time of disaster. Waste from the city and farm, forest, and marine products systems must be converted to

resources while soluble resources in the sea must be reclaimed. A nuclear fuel cycle which includes foreign lands when necessary has to be established. In this manner there is need to respond to needs for large volume resource materials transport while production services and consumer service have to be made more versatile to make possible better response to diverse needs and economic efficiency. No doubt automobiles will play a major role here. In order to promote these developments, it is desirable that the automobile industry make all-out advances from its side in the area of transport traffic which compete with the automobile.

Restaurant and cafe chains, use of central kitchen, and automation and mechanization of labor intensive functions such as dishwashing make great advances. (86)

Projects in the line of technological guidance to the development of agriculture and construction of infrastructure in developing and emerging countries of small arable land area and high population density become important and urgent international problems. (86)

Recovery of urban trash and transport to remote area system (community plant). (87)

An industry which offers utility service with storage, distribution center, and packaging center capabilities serving small and medium wholesale businesses and small retail businesses is quickly developed. (88)

Development of disaster proof distribution system which will supply necessary goods in minimum time to residents affected by earthquakes, typhoons or flood. (89)

Taxis which are cabin type vehicles in between demand buses and taxis play considerable role in traffic about existing city areas. (89)

Reclamation and land improvement of inland marshy areas and seashores create arable land, and large scale rice production of highly mechanized nature is introduced. (90)

Technological guidance such as on infrastructure construction for developing and emerging countries of wide land area and low population density to enable production of principal cereal products which can be exported to Japan at low cost. (91)

A service network with wide repertoire and able to handle all kinds of food orders which are delivered to homes proliferates over the whole country. (92)

Large scale multiple line high speed horizontal mover (moving sidewalk) is introduced as large volume human transport system for parts of cities. (93)

A community car mode by which small nonpolluting, safe, and low cost electric automobiles are used as desired in urban centers becomes practical. (96)

Cereals, feed, and animal husbandry production in mountain foothills and the highlands is introduced to produce food types formerly not produced in Japan, and this business becomes considerable. (97)

Development of unmanned distribution system which is a combination of unmanned loading, storage handling system, and unmanned truck. (98)

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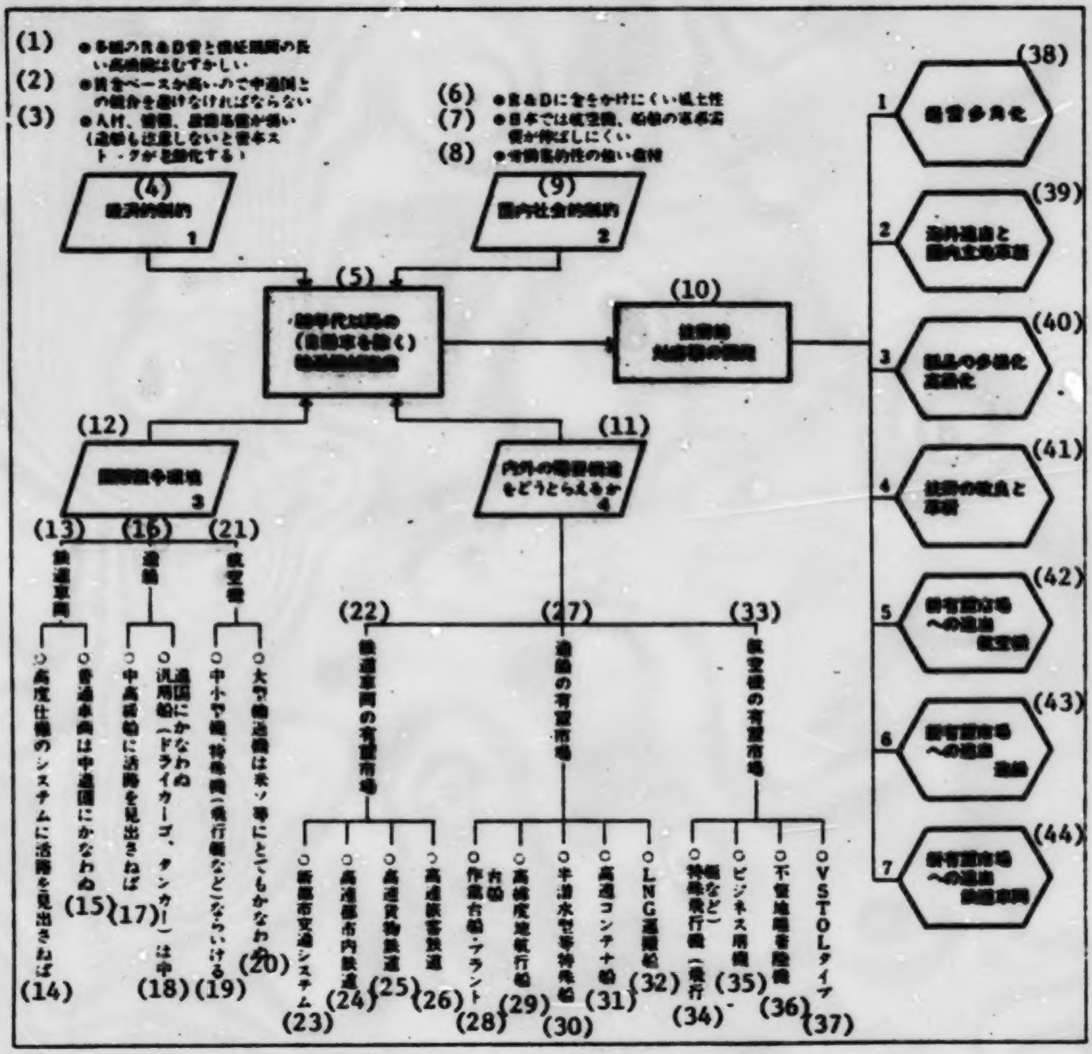
OTHER TRANSPORT EQUIPMENT

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 197-199

[Text] Promising New Fast Express Train, Special Boats, Seaplane

Shipbuilding and railroad rolling stock production industries are already said to be the domain of developing countries, and countries such as Korea, Spain, India, Brazil, and Singapore are pushing each other about in the world's market.

On the other hand, the world is coming to Japan for information on the fast express train and its associated technology. There is expected to be great demand in the area of shipping for LNG tankers, highspeed container vessels, factory ships, work ships, high latitude icy seas navigating ships, semisubmerged transports, and superautomated ships which represent high class special seacraft. This area is one which is still thought to be beyond the capabilities of developing countries. Aircraft production still suffers from the postwar delay in getting started, but there is need to get started quickly on closing the gap between Japan and the United States and the Soviet Union on STOL type planes which are tough medium class transport planes for takeoffs and landing on irregular terrain and large or superlarge seaplanes which do not require a landing field and thereby add to Japan's unique repertoire.



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(14) ○高度仕様のシステムに活路を見出さねば
(15) ○普通車両は中進国にかなわぬ
(16)
(17) ○汎用船（ドライカーゴ、タンカー）は中進国にかなわぬ
(18) ○中高級船に活路を見出さねば
(19) ○中小型機、特殊機（飛行艇など）ならいける
(20) ○大型輸送機は米ソ等にとてもかなわぬ
(21)
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(23) ○新都市交通システム
(24) ○高速都市内鉄道
(25) ○高速貨物鉄道
(26) ○高速旅客鉄道
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(28) ○作業台船・プラント
(29)
(30) ○半潜水型等特殊船
(31) ○高速コンテナ船
(32) ○LNG運搬船
(33)
(34) ○特殊飛行機（飛行艇など）
(35) ○ビジネス用機
(36) ○不整地離着陸機
(37) ○VSTOLタイプ
1 (38)
2 (39)
3 (40)
4 (41)
5 (42)
6 (43)
7 (44)

Key:

1. It is difficult to conduct research and development of high cost and long development period
2. The high wage scale necessitates avoiding head-on encounters with developing countries
3. Manpower, information, and facility bases are weak (unless carefully watched, shipbuilding capital stock will age)
4. Economic limitations
5. Transport machine industry (excluding automobile) in the post-80 period
6. Atmosphere which makes difficult allotting funds to research and development
7. Demand for military aircraft and ships in Japan is extremely small
8. Strongly labor-intensive industry
9. Japan's social restrictions
10. Development of technological countermeasures

11. How do you assess domestic and foreign demand structures
12. International competitive environment
13. Railroad rolling stock
14. Need to activate system of high level specifications
15. No way of competing with developing countries on ordinary rolling stock
16. Shipbuilding
17. Need to direct activity at middle and high class ships
18. No way of competing with developing countries on ordinary type ships (dry cargo, tankers)
19. Small or medium airplanes and special planes (such as seaplane) are possible areas
20. We cannot compete with the United States and Soviet Union where large planes are concerned
21. Aircraft
22. Promising market for railroad rolling stock
23. New urban traffic system
24. High speed intraurban railroad
25. High speed freight railroad
26. High speed passenger railroad
27. Promising markets for ships
28. Work ship, plant ship
29. High latitudes ship
30. Semisubmerged special ship
31. High speed container ship
32. LNG transport ship
33. Promising markets for aircraft
34. Special aircraft (such as seaplane)
35. Business planes
36. Planes for use on irregular terrain
37. VSTOL type
38. Business diversity
39. Advance into foreign areas and domestic siting innovations
40. Diversification and improved quality of products
41. Improvements and innovations in technology
42. Advance into new promising markets, aircraft
43. Advances into new promising markets, ships
44. Advances into new promising markets, railroad rolling stock

Possible Technological Countermeasures

1. Business diversification--Technology export, advances in engineering. Advances in general industrial machinery (particularly in shipbuilding, waste disposal and treatment, chemical plant, steel plant where present machinery will be expanded and made more capable). Advances into system industries (particularly aircraft). Container, distribution equipment, systems (particularly railroad rolling stock).

2. Entrance into foreign countries and innovations in domestic siting--Shipbuilding (excluding land equipment) will be energetically encouraged both individually and jointly to locate in overseas sites. Aircraft will be located at remote parts of the country where land is cheap (interior). Railroad rolling stock will redevelop past sitings, concentrate.

3. Diversification and higher quality of products—Shipbuilding will discriminate toward higher class policy. Aircraft will concentrate on middle class transports, special planes. Railroad rolling stock will take up policy of producing higher class cars and systemization.

4. Improvement and innovation in technology--Design technology, fabrication technology, element technology, and assembly technology all will become directed at higher class to create a unique Japanese technology. Supporting technology such as materials and auxiliary equipment will be promoted to the utmost in the efforts to improve and innovate technology.

Internal construction of street cars to minimize injury to passengers in the event of collision. (1983)

Development of completely fireproof vehicles. (83)

Development of completely automated welding facility of feedback mode which checks for flaws in welded sections as welding is taking place. (86)

Development of super cavitation pump and super cavitation propeller for ships. (87)

Development of automated assembly line system for diverse product small volume production in which the automated assembly unit has learning capability. (88)

Development of automated fabrication line in which several sets of fabrication methods can be performed on the same line. (88)

Development of bonding agent to bond steel and cast iron with the same strength as welded material. (88)

Advances in simulations methods eliminate the need to conduct large model experiments for the design of ships and airplanes. (90)

Advances in communication guidance systems and ground systems enable almost complete automation of domestic plane landings and takeoffs. (90)

Wide use of prediction and safety system of high degree automation which constantly collects, stores, and analyzes shipping information to always maintain normal activity state. (92)

Ships constructed with high impact absorbing capability. (92)

Development of airplanes built of all plastic construction using carbon fiber and boron fiber reinforced plastics. (92)

Development of composite building material with density less than 5, tensile strength 250 kg/mm^2 or more, and cost less than 3,000 yen/kg. (94)

Development of super strong Al alloy, and alloy with tensile strength greater than 80 kg/mm^2 becomes possible. (95)

Development of super high speed submarine craft using jet propulsion mode. (96)

Development of large freighters and tankers with low resistance to waves (or none), fuel economy, and high speed by going to a semisubmerged or totally submerged mode. (97)

Development of aluminum alloy with tensile strength greater than 90 kg/mm^2, yield strength greater than 70 kg/mm^2, and weldable. (98)

Development of ship propulsion engine using electromagnetic jet propulsion mode. (99)

Large ships and bridges will be assembled by adhesive fabrication method. (02)

Nuclear powered prime movers will be lightened in weight and used in manned aircraft. (03)

5. Advances into new promising markets (1)--Where aircraft is concerned, Japan should aim at areas where it can accumulate experience and technology and where there is worldwide demand. Some examples are given below.

Domestic stationary satellite beamed TV broadcasts are received directly in homes. (86)

Use of flying firefighting equipment for spraying water and fire extinguishing chemicals in the event of large fires makes up firefighting equipment of large cities and industrial belts. (89)

Wide use of guidance system which monitors the land night and day to observe fires and guides the firefighting process. (90)

Development of air bus system between international airports and major cities through the use of medium class VTOL passenger planes. (90)

Appearance of GETOL airplane (airplane which can take off and land on both water and land making use of the jet ground effect). (91)

Popular use of company planes or transport charter service for liaison service or emergency transport service. (92)

Wide use of short takeoff and landing planes on irregular terrain for quick freight transport become used widely both in Japan and abroad. (93)

A geodesic satellite to observe changes in the earth's crust and used in surveying launched by purely Japanese means (or by Japanese funds) is launched. (97)

Complete coverage of Japan and its surrounding area by a resources search satellite with high level of capabilities built and launched by Japanese technology. (00)

A science and technology research satellite built and launched by Japanese technology will be used for material science research, and the production and finishing of super high purity and super high performance materials as well as astronomical observations. (02)

6. Advances into new promising markets (2)--Japan will no longer be able to compete pricewise with partially developed countries such as Korea, Spain, and Brazil in the construction of the common run of ships such as dry cargo ships and tankers, and the situation in the mid 80's does not seem to warrant any large orders for this type of ships. With this in mind, attention will be directed from here on to accumulating high level technology for the construction of LNG tankers, work ships, plant ships, ocean development equipment, highly automated ships, fast container vessels, ocean hovercraft, and such.

Developing countries still do not have adequate infrastructures such as harbor and port facilities, and RORO type ships which are designed for such transport situations still play major roles. (87)

Remote operations of seagoing work vehicle. (87)

Development of leakproof tank for undersea storage. (88)

Development of underwater workstand ship where operations can be carried on regardless of large waves. (88)

Development of seagoing air-cushion ship. (90)

Development accompanying ocean development of safe underwater operating system (device which automatically avoids collision). (90)

Development of ocean pusher barge (seagoing barge) for carrying freight which does not have to be delivered in a hurry (such as fuel) in economical manner. (90)

Various types of RORO ships and seagoing pusher barge mode in which a large number of small barges enclosed in a frame are pushed by a large tug along with seaboard loading and storage facilities are widely used for developing countries with inadequate infrastructure. (91)

Superlarge open sea floating fish preserve (or raft) which encloses a complete food chain starting from plankton and growing plants are used in a fish raising system. (91)

System to recover manganese nodules and red mud from 3,000-5,000 meters depth of the Pacific Ocean and utilize important mineral resources such as nickel, copper, and cobalt. (92)

Most of the seagoing cargo ships and tankers owned by Japan will be super automated ships using computers and automatic control systems. (92)

Wide use of power generation ships, water making ships, and storage barges in overseas siting areas where infrastructure and utilities are inadequate. (93)

Seagoing recreation in which teams are formed to charter relatively unscheduled ships for 2-3 weeks cruise to some fairly distant place to enjoy seaboard life becomes popular. (94)

Submarine with unmanned remote deep sea search system (RUWS) (capable of operating at several thousand meters depth). (94)

Development of icebreaking cargo ships and semisubmerged cargo ships to ply the polar sea and the high latitude seas to take advantage of the shorter distance. (97)

Super large and super fast nuclear powered container ships are developed by the leading countries to wield great competitive edge over nonnuclear ships. (97)

Nuclear powered submerged linked freight ship. Development of a submerged cargo vessel in which the engine part and the cargo part are coupled together similar to a freight train. (98)

Industries such as paper pulp, ammonia, petrochemical, and aluminum which are resources dependent, require water, and are electricity dependent are sited on seagoing plants, provided with water making and power generating facilities, which are good for a few years, are movable, and are cheap. (99)

Power plants generating electricity from ocean energy such as the Black Current (Kuroshio) along the island groups south of Kyushu (Osumi Strait) and Okinawa, sea water temperature differential, and tides and the utilization of the power generated by chemical industry or aluminum production are developed. (00)

Construction and utilization of large canals to connect the Japan Sea to the Pacific by way of Lake Biwa and to extend to the inner reaches of the Kanto Plain where seagoing dry cargo ships and tankers can ply (similar canals have been constructed in some EC countries). (01)

7. Advances into new promising markets (3)--Common use and ordinary railroad rolling stock again are products in which Japan will no longer be able to compete with the developing countries, and there is need now for the production of high class rolling stock and to cater to Japan's needs such as the construction of a second Tokaido express line, new freight lines, intraurban railroads, and transport engines with capabilities similar to the railroad and to export high level transport and traffic technology products to the world.

Subways and monorail type urban traffic systems are operated in unmanned manner. (89)

Appearance of superconducting levitation method, linear motor, plastic type light body super high speed HGST railroad (500 km/h). (91)

Appearance of second Shinkansen [Bullet train] (non-noise pollution) operated with superconductor linear motor (400-500 km/h) or paramagnetic conduction (200-300 km/h). (92)

Late night trips of subways become one of effective traffic means of reverse transport system for waste. (92)

Large scale multiline high speed horizontal mover (moving sidewalk) is used as a large volume people transport system in large cities. (93)

A vehicle for human transport with very light body using short rotor type linear motor is used as passenger vehicle in the heart of cities. (94)

Appearance of self-moving sidewalks of considerable distance in large cities and tourist spots. (95)

Appearance of wide area automated overall control railroads with completely unmanned express train groups. (95)

Wide use of underground pressurized tube freight transport or vacuum transport lines between freight depots or distribution centers and local streets. (98)

Homes in newly developed or redeveloped areas have option of subscribing to air capsule terminal distribution service. (98)

New freight lines consisting of large diameter steel pipes or concrete embedded tubes through which dolleys loaded with containers are used to transport goods either under pressure or under vacuum. (99)

New freight lines in which large diameter steel pipe or concrete pipe is embedded with large conveyer running through for continuous transport of goods. (01)

Appearance of super high speed train traveling at about Mach 1. (03)

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ELECTRONICS INFORMATION

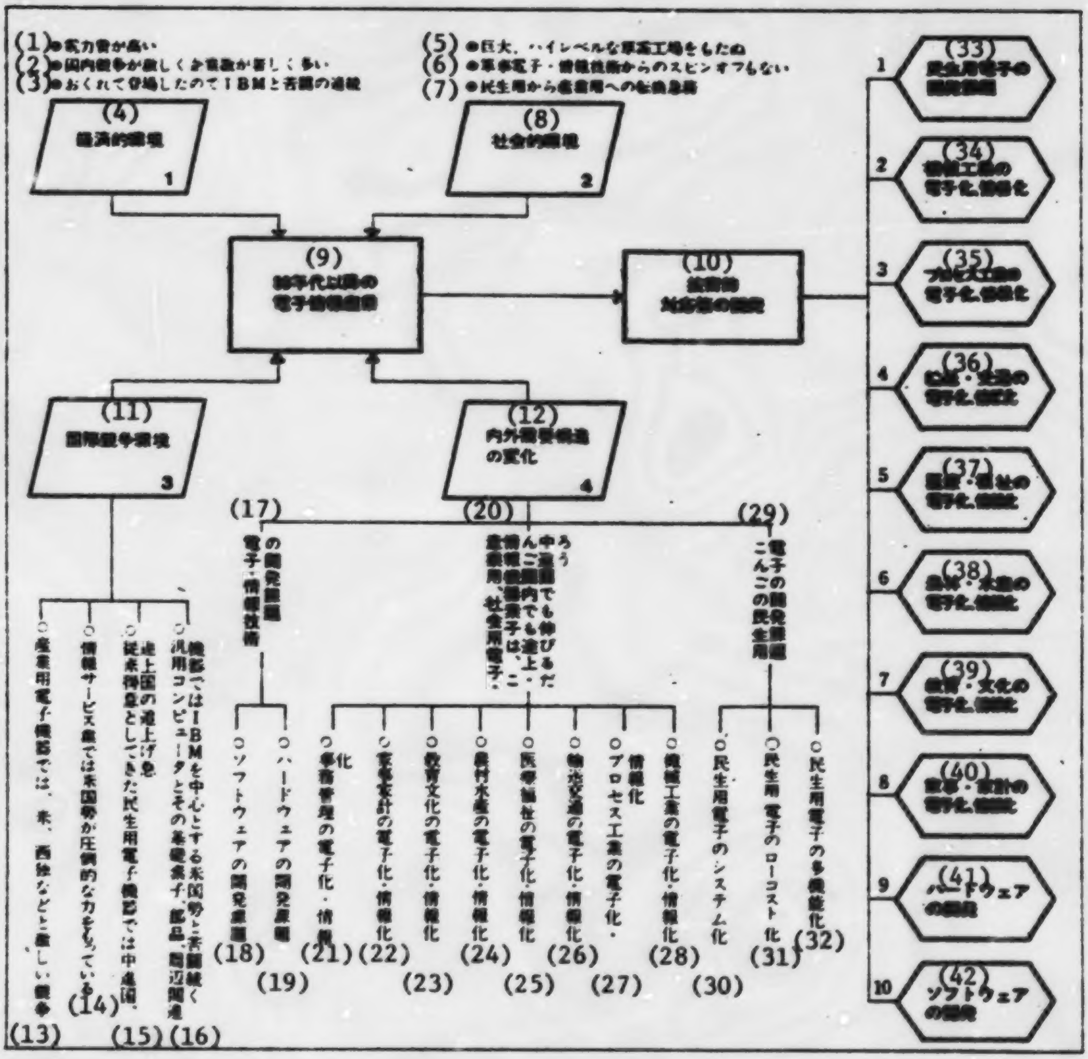
Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 200-203

[Text] Attention to Social Use Electronic Equipment With Large Market

Electronics and information technology has penetrated all areas of life as the social and economic nervous system, and this is a characteristic of the fourth quarter of the 20th century. It is an industry which has exhibited a very high rate of growth even during long term low growth in other areas, but competition is fierce both at home and abroad.

The bitter fight continues over ordinary computers and their basic components and parts with the American industry headed by IBM.

Consumer electronics which was Japan's forte in the past is now being contested by emerging and partially developed countries, and there is need to expand into the areas of industrial electronic equipment, and communication and broadcast equipment. Higher class consumer electronics, multiple capability, and systematization have to be promoted. At the same time, there is a need to accurately assess the needs of large industries and society for electronics both with respect to long term growth and market scale and to promote development and improvement of new capabilities, systems, equipment, and components.



(1) ●電力費が高い
(2) ●国内競争が激しく企業数が著しく多い
(3) ●おくれて登場したのでIBMと苦闘の連続
(5) ●巨大、ハイレベルな軍需工場をもたぬ
(6) ●軍事電子・情報技術からのスピンオフもない
(7) ●民生用から産業用への転換急務
(4) 経済的環境 1
(8) 社会的環境 2
(9) 80年代以降の電子情報産業
(10) 技術的対応策の開発
(11) 国際競争環境 3
(12) 内外需要構造の変化 4
(13) ○産業用電子機器では、米、西独などと激しい競争
(14) ○情報サービス業では米国勢が圧倒的な力をもっている
(15) ○従来得意としてきた民生用電子機器では中進国、途上国の追上げ急
(16) ○汎用コンピュータとその基礎素子、部品、周辺関連機器ではIBMを中心とする米国勢と苦闘続く
(17) 電子・情報技術の開発課題
(18) ○ソフトウェアの開発課題
(19) ○ハードウェアの開発課題
(20)
(21) ○事務管理の電子化・情報化
(22) ○家事家計の電子化・情報化
(23) ○教育文化の電子化・情報化
(24) ○農林水産の電子化・情報化
(25) ○医療福祉の電子化・情報化
(26) ○物流交通の電子化・情報化
(27) ○プロセス工業の電子化・情報化
(28) ○機械工業の電子化・情報化
(29) こんごの民生用電子の開発課題
(30) ○民生用電子のシステム化
(31) ○民生用電子のローコスト化
(32) ○民生用電子の多機能化
1 (33) 民生用電子の開発課題
2 (34) 機械工業の電子化、情報化
3 (35) プロセス工業の電子化、情報化
4 (36) 物流・交通の電子化、情報化
5 (37) 医療・福祉の電子化、情報化
6 (38) 農林・水産の電子化、情報化
7 (39) 教育・文化の電子化、情報化
8 (40) 家事・家計の電子化、情報化
9 (41) ハードウェアの開発
10 (42) ソフトウェアの開発

Key:

1. High cost of electric power
2. Fierce domestic competition and large number of firms
3. The late start has resulted in continued uphill struggle against IBM
4. Economic environment
5. No vast and high level military plants
6. No spinoff from military electronics and information technology
7. Urgent need to convert from consumer to industrial use
8. Social environment
9. Electronic information industry of the 80's and after
10. Development of technological countermeasures
11. International competitive environment
12. Changes in domestic and foreign demand structure
13. Fierce competition with United States, West Germany, and such in industrial electronic equipment

14. United States holds overwhelming superiority in information service industry
15. Fast catchup by developing countries in the area of consumer electronics which was once Japan's forte
16. Fierce uphill fight continues centered on the United States and IBM in the area of ordinary computers and their basic components, parts, and peripheral equipment
17. Development subjects in electronic and information technology
18. Development subjects in software
19. Development subjects in hardware
20. Electronic and information equipment components for industrial and social use are expected to increase in this country as well as in developing countries
21. Use of electronics and information service in business management
22. Use of electronics and information service in home calculations
23. Use of electronics and information service in education and culture
24. Use of electronics and information service in farming and fishing
25. Use of electronics and information service in medicine and welfare
26. Use of electronics and information service in transport and traffic
27. Use of electronics and information service in process industries
28. Use of electronics and information service in machine industries
29. Future electronic developments for consumer use
30. Systematization of consumer electronics
31. Low cost efforts in consumer electronics
32. Multiple uses of consumer electronics
33. Development subjects in consumer electronics
34. Use of electronics and information service in machine industry
35. Use of electronics and information service in process industries
36. Use of electronics and information service in transport and traffic
37. Use of electronics and information service in medicine and welfare
38. Use of electronics and information service in farming, forestry, and fishing
39. Use of electronics and information service in education and culture
40. Use of electronics and information service in household calculations
41. Development of hardware
42. Development of software

Possible Technological Countermeasures

1. Developmental Subjects in Consumer Electronics

Practically all consumer equipment will be tied in with electronics and information related capabilities with advancements in multiple use, low cost, and systematization.

Multiple uses, modular use, and systematization of home labor saving appliances are promoted. (1989)

Healthy competitive and perseverent spirit of man is promoted through games and sham events, and games and pleasures which catalyze such spirit in man become desirable. (92)

Microprocessors (microcomputers) become low in cost in line with today's small motors (for washing machines and vacuum cleaners), and the operation and energy conservation features of consumer electric appliances become considerably improved. (94)

High performance microcomputers and simple peripheral and terminal equipment become low in cost greatly facilitating the program control of consumer appliances. (95)

2. Use of Electronics and Information Service in the Machine Industry

Development of feedback type completely automated welder which automatically checks for flaws in the welded section while the welding is taking place. (86)

Appearance of automated assembly facility which can assemble a number of similar type products on a single line without need to change lines. (87)

Establishment of made-to-order distribution which handles orders to sales in a complete series via a computer system. (87)

Development of a loading robot. (87)

A number of sets of differing fabrication methods of automated fabrication lines are group controlled. (88)

Development of a manipulator with feel which alters the handling of an item according to the surface, weight, and shape of the item. (88)

Development of an automated assembly line system consisting of automated assembly machines for producing multiple variety small volume products. (88)

"Assembly automation" of at least the same level of present fabrication automation and process automation is established, and automation of machine assembly process and levels of unmanned work are greatly extended from present levels. (88)

Robot eyes (power to distinguish any object once the object is indicated) are developed. (89)

Advances in simulation technology make possible the design of ships and airplanes without the need of going through large model tests. (90)

Much of the processes in a large variety small volume product plant in which product in management is very difficult is performed from the stage of judgment of production situation to the stage of NC programming treatment by conversation between the plant section chief and a computer in the traffic management, overall control, and management system that is utilized. (92)

Most of the ordinary scale malfunctions in a machine fabrication plant is repaired and parts replaced and inspected in automated manner in the systems that will be developed. (94)

Automated lines will be comprised of machines with self-repairing capability. (98)

3. Use of Electronic and Information Service in Process Industries

The internal structure of metal materials will be directly observed by atomic order. (85)

Cast production process will be automated, unmanned and equipped at least on the order of present-day rolling process. (89)

Wide use of protection and safety system which grasps the overall and local situations within a plant, constantly accumulates new information and analyzes it, and sends out appropriate before-the-fact alarms automatically from telotechnological viewpoint. (91)

Development of a system which repairs ordinary scale malfunctions within a process industrial plant in unmanned manner, replaces parts, and inspects the completed repair. (92)

Development of a machine production technology with automated replacement capability when parts deteriorate or wear (traveler, picker, etc.). (93)

Various mechanical properties of metal materials will be measured simply through the use of nondestructive testing. (93)

Establishment of theory for new alloy formulation which makes possible the development of new alloys with the use of computers. (93)

Development of compact steelmaking plant (the process from pig iron making to at least the primary product is greatly reduced, the various equipment is automated and made continuous, and there is overall computer control). (95)

The present batch pig iron making and steelmaking is changed to a completely continuous process to the end, continuous refining technology is exercised from molten pig iron to steel, connections are made to continuous casting and continuous rolling technology, and unmanned steelmaking plant is developed. (01)

4. Use of Electronics in Transport and Traffic

Development of device to prevent collisions and contact between automobiles. (86)

Development of system to automatically select a desired ship from among those at sea and exchange information. (89)

Worldwide use of an automated system to prevent midair collisions of aircraft. (89)

Development of automated navigation of ships through a ground office and communication satellite (prevention of collisions and positional errors technology which will make other technologies possible. The rest is an experience problem). (89)

Development of automated navigation for aircraft using ground office and communication satellite. (90)

Development of completely unmanned land-based guiding system for ships entering or leaving a harbor. (90)

Advances in communication, guidance system, and plane onboard system technologies take place in international manner making possible automated takeoffs and landings by international transport planes. (90)

Automated takeoff and landing systems are installed on major airplanes in major airports. (90)

Development of automated transportation in which a portion of high speed highways is in a completely guided automobile system. (91)

Development of a highly automated protection and safety system which constantly grasps, accumulates, and analyzes information on ships and always maintains normal operating state. (92)

Most of the seagoing freighters and tankers of our country will be equipped with onboard computers and automated control systems to make them super automated ships. (93)

Development of wide area automated total control transport railway network of a totally unmanned operational mode. (95)

Development of airplanes with automated takeoff and landing system and completely guided control system which does not need pilots. (99)

5. Use of Electronics and Information Service in Medicine and Welfare

Development of screening methods for diseases such as cancer through automated processing of X-ray photographs. (84)

Wide use of mobile diagnostic vehicle which circulates around plants where handicapped and aged workers are employed to conduct health diagnosis quickly. (85)

An individual's athletic capabilities are determined by test equipment and body measurements, and his adaptability to sports is determined rationally. (85)

Body monitor which is installed on a patient to make periodic measurements, transmit the results to a medical information center automatically, reports the automated analytical results to the physician in charge, and sounds an alarm if any patient is in distress. (86)

Development of a system which produces braille character printing with low power output and economically to enable the totally blind access to information nearly to the level available to a normal person. (87)

Man-machine system, equipment, and facilities will be developed and widely used by which the physical and mental conditions of physically handicapped and aged are measured and judged, the optimum occupation in line with the wishes of the patient is discussed, and a training program is drawn up. (87)

Hospital automation becomes common in which large hospitals (500 beds or more) maintain overall control of information, parts and materials, examinations, and performance and analysis of tests. (89)

Development of a system which provides management for medical history record, insurance calculations, physical examination results, patient examination results, and the analytical results for small hospitals and individual diagnostic offices where the most recent equipment or computer are not available. (90)

Perfection of patient unit which provides patient monitoring and special treatment bed so that chronically ill being cared for at home can receive high level treatment. (90)

High level auxiliary devices are developed to replace or supplement sensory functions such as sight, hearing, or touch and intent functions such as voice for the physically handicapped and are made available by the country or local governing body. (90)

Appearance of a system in which the input of a certain code by a physician selects the appropriate tape which makes available in 3 minutes information on the most recent diagnosis and treatment. (91)

High level artificial limbs are developed which through the combination of brain commands, VLSI, electric power, gas pressure, and hydraulic pressure provide muscle power close to that of a normal person, and these are made available by the central or local government. (92)

Thesaurus and algorithms are compiled by cooperation of physicians, universities, and research organs to enable ready search of data banks established on symptoms, state, patients' complaints, and condition of patients which become available to the practicing physicians. (94)

Development of a system in which all the available information in the world on medical supply effects, operating mechanism, side effects, application, and dose relative to treatments that medical people, the public, and the individual should know can be accessed through on-line real-time telephone dialog while detailed information is presented through stationary figures on CATV. (94)

The mechanisms of brain and nerve functions are understood to the level that technical advances in electronics, ME, and servomechanisms enable the assembly of fairly simple devices which will enable severely physically handicapped and muscle deterioration patients to be able to perform basic functions, and these units are made available by the central and local governing body. (95)

Wide use of telephone box style health facility distributed on street corners and in public facilities by which the general public can obtain free or low cost unmanned mechanized health diagnostic service. (96)

System is developed by which the diagnosis and treatment of special difficult to treat diseases are handled through TV-telephone, data communication, and satellite communication to enlist the aid of specialists all over the country and at times over the entire world through TV-telephone consultations. (96)

6. Use of Electronic and Information Service in Agriculture, Forestry, and Marine Product Areas

Use of computer obtained information on the application of ultrasonic waves to make possible vertical and horizontal location of fish schools (type, number, and position of fish). (86)

Development of control system by which air temperature, moisture, and sunlight environmental conditions are related to plant growth and provide the necessary irrigation and fertilizer application practices. (87)

Development of unmanned grazing and animal husbandry system. (91)

Development of technology that will enable simultaneous measurement of physical state of higher plants such as humidity-moisture relations in nondamaging and economical manner. (92)

Construction of completely unmanned fermentation plant. (93)

Development of technology to observe fish movements through biotelemetry. (94)

Development of technology by which information on physiological properties of higher plants such as respiration, photosynthesis, and transpiration are calculated without damage to the plant as a function of time. (94)

Development of technology by which information on biochemical properties of higher plants such as sugars, lipids, proteins, and active agents are measured and calculated without damage to the plant as a function of time. (96)

7. Use of Electronics and Information Service in Education and Culture

Video tape (including stereo TV) to transmit information on books, magazines, and records of the past as well as more wide ranging and numerous information becomes an important information medium. (87)

The development and improvement of industrial simulators which simulate the handling of new machines and equipment and the operation of new functions with high degree of realism and in efficient manner begins to play important role. (90)

Facilities which maintain video tapes (including stereo TV), run loan service, and reproduce the tapes begin to play large role alongside the present libraries. (91)

Development and construction of equipment and facilities to provide wide range of occupational and special education by use of CAI (computer aided education) at the convenience both in time and place of the prospective student become important industrial activity. (92)

Screening houses for a broadcast university are located in major cities throughout the country and are provided with training equipment, information equipment, and educational equipment to offer highly intensified service. (92)

Wide use of comprehensive terminal facility by which information in various forms such as voice, characters, or pictures are readily obtained from libraries, museums, or science and technology centers. (99)

8. Use of Electronics and Information Service in Households

Use of unit machines to save labor in household activities increases and level of automation rises. (87)

Equipping of homes with cleaning (central cleaning system), trash disposal, burglar proofing, and shutters and storm door opening and closing devices becomes commonplace. (89)

Systematization of household labor (laundry, telephone connections, cooking, dishwashing, door closing, and air conditioning is performed comprehensively and semiautomatically by properly programmed equipment that will be developed). (89)

Rational organization of business offices of local public groups and office automation are introduced along with innovations in the system to greatly improve service to the people. (89)

Telephone or CATV or even direct consultations with local governing group, public group, or firm to obtain free or low cost information on babycare, household items, cooking, law, consumer products, hobbies, or DIY becomes widely used. (89)

Telephone, CATV, or direct consultation with household consultants to obtain paid information on baby care, household items, cooking, law, consumer goods, hobbies, or DIY becomes widely used. (90)

A business is quickly established in which fairly high level fiber making, forming technology, and measurement technology are turned toward firmware (conversion of software into hardware and black box) and systematized to bring about reforms designed to bring textiles products back to the top. (93)

Developments and low cost trends in information processing, measurement, and communication technologies make possible real time service for services to remote distances (internationally as well) in high class made to order clothing, orders for Pretapolte [phonetic], tacking, and sales. (93)

System in which a consumer can have shoes of his own design made on an automated machine. (94)

Technological advances and mass production bring the cost of microprocessors (microcomputers) down to the level of present-day small motors (motors used in refrigerators and vacuum cleaners), and consumer electric appliances become easier to operate and energy conserving. (94)

High performance microcomputers and easy use peripheral and terminal equipment and communication system become available at low cost. The housewife will be able to switch the operation of rain shutters or cooking appliances through a public telephone. (98)

Home cooking and household finances become compulsory educational subjects, and the use of microcomputer and telephone software make it possible for any ordinary person to manage household bookkeeping with ease. (98)

9. Hardware Development Topics

Optical fibers of several micron diameter will become available at 1/100 the cost of the present material. (85)

Super small computer (few W power consumption with capability of today's medium size computers) will be developed. (86)

Practical development of random access memory with at least one order faster speed, same cost, and 1,000-fold capacity. (87)

New component using Josephson junction becomes practical. (87)

Development of wall TV with the appearance of efficient optelectronics material. (89)

Development of information processing electronic equipment of high integration density obtained by growing multilayer single crystal films. (89)

Development of high speed and density memory element using the magnetooptical effect. (89)

Development of optical memory medium with the sensitivity of photographic film and which can have information rewritten. (89)

Practical development of high density and capacity memory of 10^{15} bit or more. (92)

Processing capability of computers will be extended two orders of magnitude above today's level to contribute to learning and recognition capabilities. (93)

Development of single crystals capable of 3-dimensional high density memory. (93)

Material which itself has circuit properties emerges as successor to LSI. (94)

Development of super high speed large photo computers based on light interactions. (01)

10. Software Development Subjects

Appearance of automated libraries (receipt, storage, search, and copy are performed by computer in short order). (86)

A small device by which a person writing as though on paper with pencil inputs information into a computer. (88)

A computer program can be set up by the use of Japanese very close to the everyday language. (89)

The subjects, index, and table of contents of newspapers, magazines, and books are automatically read in, the necessary articles are selected from the key words, secondary information is generated, and the information placed in a data bank in the information processing system that is developed. (91)

Countrywide and worldwide computer network for open commercial use and, if necessary, with connections to closed or semiopen systems by which software and data can be jointly used over a wide area. (93)

Voice recognition and voice synthesis technologies advance greatly, and information processing can be initiated by voice input to computer. (94)

Voice control and input of computers becomes possible. (95)

Development of automated translation system between Japan and 7-8 countries of the world for handling commercial, scientific, and technological documents. (95)

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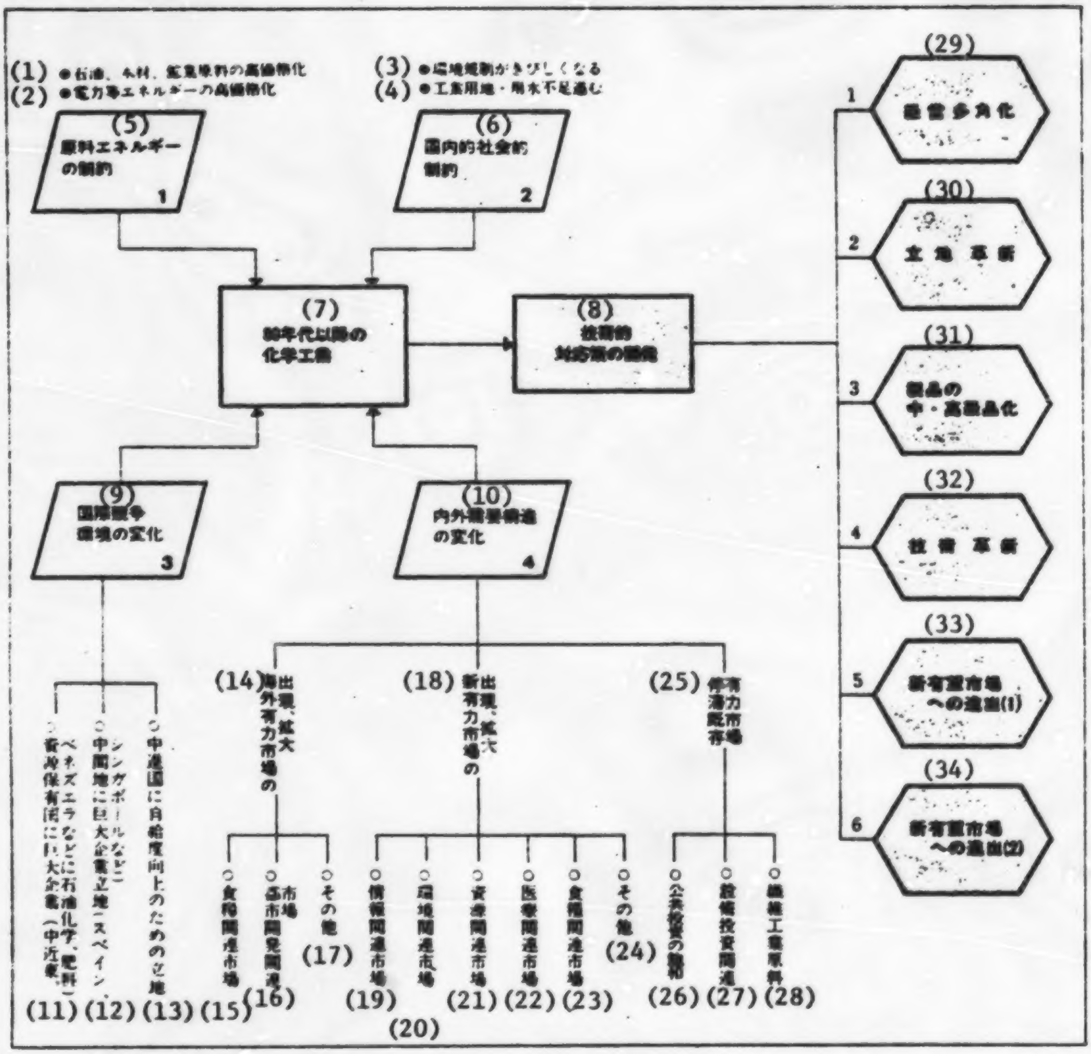
CHEMICAL ENGINEERING

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 204-206

[Text] Resources Recovery "Ocean Water Chemistry" Pathway

The high cost of basic raw materials and energy are becoming disadvantageous long term conditions for Japan, and environmental costs and siting are major problems. There is no doubt that the post-80 era will see Japan engage in fierce competition in ordinary and middle class goods with resources blessed countries (Saudi Arabia, Iran, etc.) and with partially developed countries (such as Singapore) and in middle and high class goods with the leading countries.

Among these various industries, the ocean water chemical industry (recovery and utilization of uranium, lithium, and thorium dissolved in sea water) is thought to offer some advantageous aspects to Japan which is a marine country. Should such a project succeed, Japan's chemical industry will be able to make an about face from a purely defensive stance to one of attack. At the same time, some great contribution can be expected to the domestic and foreign food problem, environmental problem, medical problem, and assurance of basic materials for the electronic and information processing industries.


(1) ●石油、木材、鉱業原料の高価格化
(2) ●電力等エネルギーの高価格化
(3) ●環境規制がきびしくなる
(4) ●工業用地・用水不足進む
(5) 原料エネルギーの制約 1
(6) 国内的社会的制約 2
(7) 80年代以降の化学工業
(8) 技術的対応策の開発
(9) 国際競争環境の変化 3
(10) 内外需要構造の変化 4
(11) ○資源保有国に巨大企業（中近東、ベネズエラなどに石油化学、肥料）
(12) ○中間地に巨大企業立地（スペイン、シンガポールなど）
(13) ○中進国に自給度向上のための立地
(14) 海外有力市場の出現、拡大
(15) ○食糧関連市場
(16) ○都市開発関連市場
(17) ○その他
(18) 新有力市場の出現、拡大
(19) ○情報関連市場
(20) ○環境関連市場
(21) ○資源関連市場
(22) ○医療関連市場
(23) ○食糧関連市場
(24) ○その他
(25) 有力既存市場の停滞
(26) ○公共投資の鈍化
(27) ○設備投資関連
(28) ○繊維工業原料
1 (29) 経営多角化
2 (30) 立地革新
3 (31) 製品の中・高級品化
4 (32) 技術革新
5 (33) 新有望市場への進出(1)
6 (34) 新有望市場への進出(2)

Key:

1. Increasing cost of oil, lumber, and raw materials
2. Increasing cost of energy such as electricity
3. Environmental regulations become more strict
4. Inadequate industrial sites and water supply problems increase
5. Limitations in energy raw materials
6. Domestic social limitations
7. Post-80 era chemical industry
8. Development of technological countermeasures
9. Changes in international competitive environment
10. Changes in domestic and foreign demand structure
11. Resources rich countries develop giant industries (Near and Far East, Venezuela develop petrochemical and fertilizer industries)
12. Large industries develop in partially advanced countries (such as Singapore, Spain)

13. Siting in partially developed countries for improving self-supply
14. Appearance and expansion of promising foreign markets
15. Food related market
16. Urban development related market
17. Other
18. Appearance and expansion of new effective markets
19. Information related market
20. Environment related market
21. Resources related market
22. Medical related market
23. Food related market
24. Other
25. Effective markets which are presently stagnant
26. Saturation in public investment
27. Facilities investment related
28. Fiber industry raw material
29. Multiple faceted business
30. Siting innovations
31. Raising product quality to middle and high class
32. Technological innovation
33. Advance into new promising markets (1)
34. Advance into new promising markets (2)

Possible Technological Countermeasures

1. Multiple nature of business--Export of compact multipurpose plant technology. Pollution prevention in the chemical industry, maintenance service. Water utilization and irrigation in agriculture, agriculture using various facilities, hydroponics, waste management and disposal service for self-governing bodies, construction of food storage facilities, and technology guidance service.

Development of method for stabilizing dumped sea bottom sludge. (1985)

Environmental pollution becomes severe problem in considerable number of areas of several developing countries, and export of Japan's pollution prevention devices and technology assumes substantial scale. (88)

Multipurpose plant type material plants both domestic and particularly in foreign soil which do not require too much investment and for which development of operational software will enable turnaround and financial accommodation. (90)

Development of effective means to discard and remove heavy metals such as mercury, organochlorine compounds, and organophosphorus compounds accumulated in the environment. (92)

2. Siting innovations--Base raw materials sited in remote areas, overseas sites; highly finished products on sites at sea, etc.

Seagoing pusher barge mode in which number of RORO craft and small barges are enclosed in a large frame and pushed or pulled for siting in foreign areas where the infrastructure is inadequate and at sea loading and storage bases become common. (91)

Power generating facilities utilizing ocean energy located in the island groups south of Kyushu (such as Osumi Strait) and alongside Okinawa utilizing currents such as the Black Current and sea water temperature differential, and the electric power is utilized for chemical industry or aluminum refining at at least one site and commercialized. (00)

Commercialization of hydrogen, heavy water, and deuterium production through electrolysis of sea water using solar power generated electricity at the sea surface of the lower latitudes. (02)

3. Increase quality of goods to middle and high class--Medium and high class organic polymers, middle and high class inorganic material.

Practical use of composite materials for low pressure use (composite material with strength, ductility, corrosion resistance, and weldability such as carbon fiber polymeric composite material). (84)

Industrialization of production of alumina (sapphire) very fine wire (not a whisker but long and continuous very fine wire). (87)

Practical development of adhesive agent which will join steel and cast iron materials with almost the same strength as welded joints. (88)

Development of plastic with mechanical strength of the light metal class at temperature of 250°C. (89)

Development of inorganic polymer (with heat resistance) with high elasticity after hardening. (91)

Glass with high elasticity similar to rubber with respect to instantaneous impact. (92)

Industrialization of cheap method of synthesizing diamonds through the use of catalyst without the need to employ superhigh pressure. (94)

Development of synthetic resin which can be used at high temperature above 300°C which does not lose its resistance to chemicals and mechanical strength for use in chemical facilities. (94)

4. Technology innovation--Raw material innovation, process innovation, development of aid technology.

Practical development of synthetic organic catalysts with high catalytic effect at normal temperature and pressure. (88)

Development of chemical analysis robot of high practical use. (89)

Practical development of automated chemical structural analyzer for natural organic compounds. (90)

Development of facility to produce methanol by high temperature and pressure treatment of organic waste and scraps. (90)

Advances in simulation technology for chemical plant design make pilot plants unnecessary. (91)

Production of polymers and elastomers with designed microstructure, stereoregularity, molecular weight, molecular weight distribution, and branching structure begins. (91)

A speedy process similar to plastic injection molding is industrialized as a new method for producing refractories, and the process is greatly shortened (forming, sintering are performed nearly simultaneously). (93)

A system is developed in which finely ground coal is irradiated with high energy beam such as a plasma beam by which the coal is converted to gaseous product hydrocarbons (such as ethylene, acetylene, hydrogen, CO) and necessary fuel and raw materials are extracted from this system. (97)

A science and technology research satellite is launched with domestic funds and effort to conduct materials science research, production of superhigh purity and super high performance materials, fabrication, and astronomical observations, and a system is developed for regular use of this satellite. (02)

Commercialization of facilities to utilize the ocean space to grow kelp which is of good quality and grows very rapidly while the facility is also used to recover nuclear fuel, methane gas, various metals, and iodine. (02)

5. Advances into promising new markets (1)--Advances of chemical industry and firms and chemical industrial methods into the food and agricultural market, medical and health market, resources related market, and environment related markets.

Artificial regulation of fertilizing with nitrogen, phosphorus, and potassium becomes practical (such as microcapsulation). (84)

Reliable method for establishing the freshness of sea food along with instruments to make the determination are developed. (89)

The crunch in concentrate feeds and the need to demonstrate the nontoxic nature lead to the use of petroleum family hydrocarbons, pulp waste, discarded molasses, and other materials for the production of SCP (single cell protein) which becomes an important concentrate feed. (91)

Practical prevention of cold damage to rice plants by chemical treatment. (99)

Development of agricultural chemical which blocks only a specific RNA·lefsocaze of virus injurious to plants. (00)

[Medicine, Health]

Drug for treating mycobacteria disease with little side effects. (88)

Development of antiviral agents (particularly against influenza) is promoted, and viral diseases decrease. (90)

At the present time, the development of new drugs requires 15-20 years. Research to greatly reduce this period to about 2-3 years is conducted and an effective method for development and control is realized. (93)

Technology to extract in short order any heavy metal which is toxic and which lodges in the body is developed, and it is applicable to all types of materials. (94)

Development of contraceptive drug with no side effects, one dose of which provides effective protection for more than a year. (98)

Development of blood battery that is a fuel cell using the reaction between blood oxygen and blood nutrients to supply power to artificial organs (such as pacemaker). (98)

Development of completely safe organ transplants through the use of reject preventing agent with no side effects. (99)

[Resources Related]

Advances in collection, transport, and processing technology of waste tires, waste plastics, and other polymeric wastes from urban industry and rise in cost of resources make possible the reduction of these wastes into raw materials and fuel in a higher level of recycling technology than the present. (89)

The water for the Kanto coastal area, Kinki coastal area, and the Kyushu coast industrial belts will be supplied for the most part by the most abundant source, i.e., sewer water, through a high order treatment system. (89)

Domestic and Southeast Asian peat and lignite are converted to methane and methanol and the technology for their use in chemicals, petrochemical industry raw materials, and as fuel is industrialized. (92)

A system is developed by which at least 20 percent of the uranium and thorium needed per year is recovered from seawater. (03)

At least three sites for the recovery and refinement of uranium dissolved in seawater are placed on the Japan Sea coast and operated on a commercial base. (04)

[Environment Related]

Development of composite acoustic material (blots out all sound including air sound, solid sound, and transmitted sound). (86)

Composting of urban sludge to make fertilizer is extended to medium and small cities. (86)

A polymeric adsorbant working on a new principle with powerful flocculating property is developed which makes possible more compact treatment plants and eliminates the need for large precipitation ponds. (93)

Anaerobic fermentation of excess sludge from a city sewage treatment is used to produce methane gas which is sold as a fuel in the system developed. (95)

Plant plankton luxuriating on the sea surface (such as red tide, fat content more than 20 percent) is collected economically, pressurized, and heated to recover oil for which a pilot plant is built. (04)

6. Advances into promising new markets (2)--Advances of chemical industry, business, and chemical industrial methods into the machines related market, transport machine related market, electronic and information related market, and energy related market.

[Machine Related]

A cheap and strong adhesive agent which hardens when compressed by a single liquid operation (such as by the utilization of microcapsule) is developed and utilized. (83)

Development of plastic base composite structural material with tensile strength greater than 40 kg/mm^2 and of good thermal conductivity (for ocean development). (87)

Development of ceramic material which is not attacked by FeO and oxidizing gas up to temperature of about 1700°C. (89)

Development of a material which can withstand moisture and chlorine gas up to 800°C in nearly semipermanent manner. (90)

Development of rubber with good wet skid property, small heat generation, and wear resistance about 5 times better than the present rubber. (92)

Industrialization of refractories made up of giant single crystals. (94)

Development of plastics which can withstand 1200°C. (98)

Development of ductile heat resistant ceramics. (98)

[Transport Machine Related]

Development of light weight automobile using mainly composite plastic material and nonferrous light alloy. (87)

Development of tire made of material and construction that will not slip on wet pavement. (87)

Practical development of external combustion type engine (such as Freon engine). (91)

Raw materials and fuel will be transported in flexible containers within a protective framework which will be pushed or pulled by tugs. (92)

Development of automobile engine using hydrogen as fuel. (93)

Development of airplane whose entire body is made of carbon fiber and boron fiber reinforced plastic. (99)

[Electronics and Information Related]

Optical fiber elements a few μ∅ thick will be available at 1/100 today's cost. (85)

Development of random access memory with the same speed or one order higher speed and with 100 times the capacity of present-day memories will become available at the same cost. (87)

Development of functional material in which the material itself possesses circuitry functions will follow LSI. (94)

Development of artificial brain in which artificial protein is used for memory elements and logic function elements. (04)

[Energy]

Development of methane gas production by the anaerobic fermentation of organic wastes in large and medium sized cities. (88)

At least 50 percent of spent fuel has to be reprocessed in Japan, and this ratio keeps increasing. (91)

Industrialization of production of fuel oil by coal liquefaction (Note: the recoverable fuel in the world include coal: 88 percent, oil shale: 6 percent, oil: 3 percent, and natural gas: 3 percent). (94)

Methanol produced from low quality coal (peat, lignite) will be consumed at a cost per calorie about the same as low sulfur fuel oil. (95)

Practical development of extraction of uranium from rock phosphate (at least the uranium equivalent to a 1,000 MW production from a nuclear power plant can be readily obtained from the rock phosphate reserves in Japan). (00)

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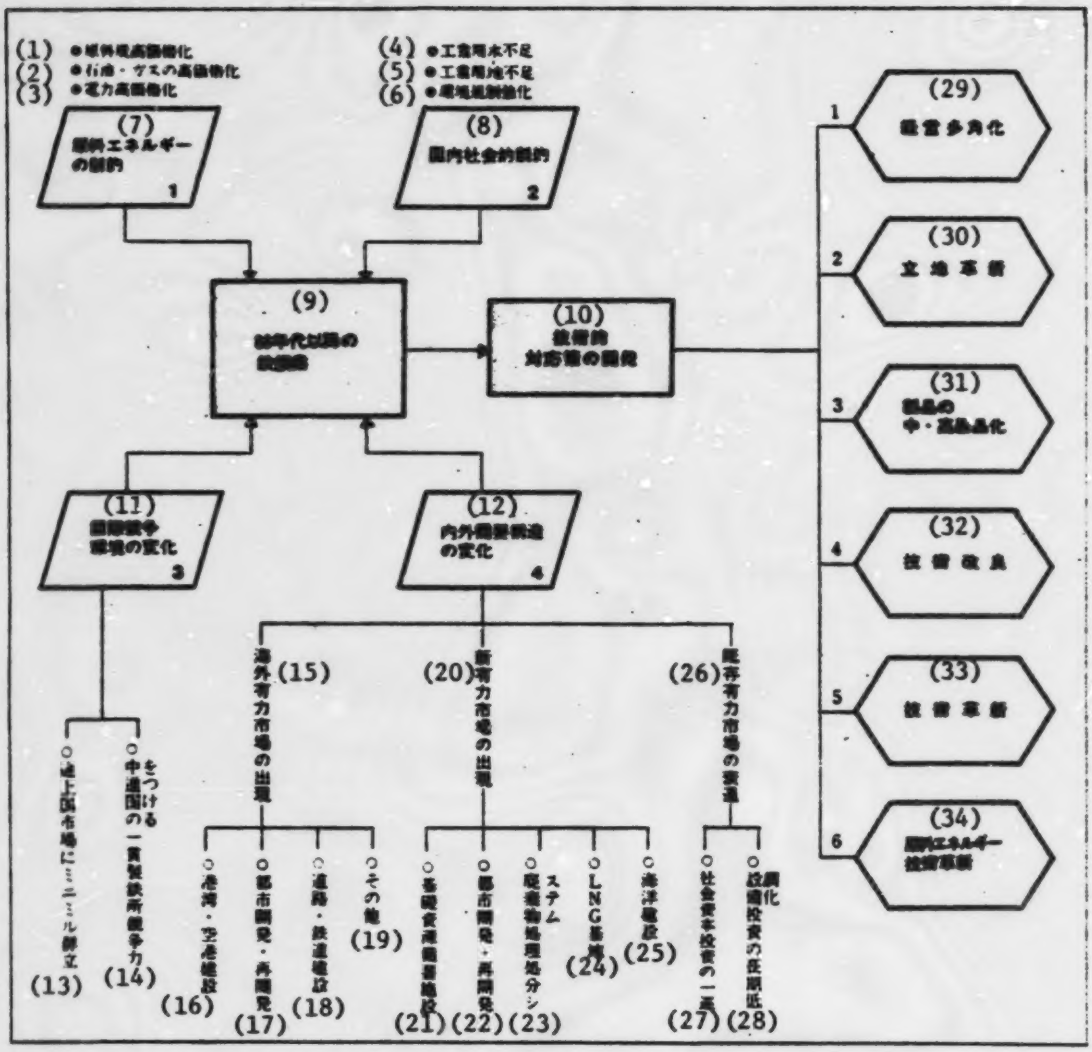
IRON AND STEEL--DIVERSIFICATION AND SOCIAL SYSTEM PRODUCTS

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 207-209

[Text] The Japanese steel industry in the post-80 period will be beset by the high cost of raw material: carbon, oil, gas, and electric power, the upward climb in environmental costs, and siting problems. However, the Japanese steel industry should be able to hold its place at the top level of the world into the middle of the 80's. On the other hand, competition is expected to be fierce with the partially advanced countries (Korea, Brazil, Iran, Taiwan) with their new integrated steelmaking plants and the Middle and Near East countries where reducing agents are free, and the minimill group with direct steelmaking capability will be a tough adversary.

Effort will be directed at export of iron and steel technology, diversification of engineering and construction, advances in new iron products, and the associated social system technology. In addition, the development, improvement, and wide use of high class steel types and materials (high tensile strength steel, strong steel, heat resistant steel, very cold temperature resistant steel, and seawater resistant steel represent one end) accompanying domestic and foreign construction and diversification of construction are the important directions for technological development to follow.


(1) ●原料炭高価格化
(2) ●石油・ガスの高価格化
(3) ●電力高価格化
(4) ●工業用水不足
(5) ●工業用地不足
(6) ●環境規制強化
(7) 原料エネルギーの制約 1
(8) 国内社会的制約 2
(9) 80年代以降の鉄鋼業
(10) 技術的対応策の開発
(11) 国際競争環境の変化 3
(12) 内外需要構造の変化 4
(13) ○途上国市場にミニミル群立
(14) ○中進国の一貫製鉄所競争力をつける
(15) 海外有力市場の出現
(16) ○港湾・空港建設
(17) ○都市開発・再開発
(18) ○道路・鉄道建設
(19) ○その他
(20) 新有力市場の出現
(21) ○基礎資源開発施設
(22) ○都市開発・再開発
(23) ○廃棄物処理処分システム
(24) ○LNG基地
(25) ○海洋建設
(26) 既存有力市場の変遷
(27) ○社会資本投資の一巡
(28) ○設備投資の長期低調化
1 (29) 経営多角化
2 (30) 立地革新
3 (31) 製品の中・高級品化
4 (32) 技術改良
5 (33) 技術革新
6 (34) 原料エネルギー技術革新

Key:

1. High cost of raw material coal
2. High cost of oil and gas
3. High cost of electric power
4. Lack of industrial water
5. Lack of industrial use land
6. Stricter environmental regulations
7. Limitations to raw material energy
8. Domestic social limitations
9. Steel industry in the post-80 era
10. Development of technological countermeasures
11. Changes in international competitive environment
12. Changes in domestic and foreign demand structure
13. Appearance of minimill group in the developing countries market
14. Add competitive power by integrated steelmaking capability of partially advanced countries

15. Appearance of influential foreign markets
16. Harbor and port, airfield construction
17. Urban development, redevelopment
18. Highway and railroad construction
19. Other
20. Appearance of new influential markets
21. Basic resources stockpiling facilities
22. Urban development, redevelopment
23. Waste management and disposal system
24. LNG bases
25. Ocean construction
26. Retreat from existing influential markets
27. One round of social capital investment
28. Long term downgrading of investment for facilities
29. Business diversification
30. Siting innovations
31. Raising products to middle or high class
32. Improvement in technology
33. Technology innovation
34. Technology innovation in raw material energy

Possible Technological Countermeasures

1. Business diversification--In the area of overall plant systems, technology export of integrated steelmaking plants and engineering. Plant types include steelmaking equipment, export of facilities, technology guidance. An even broader area including software includes the business end of steelmaking, pollution prevention, and maintenance guidance service. Other individual project type items are export of steel structures such as bridges and large buildings. A completely new area includes ocean plants and ocean residential parks where artificial land is created.

Many sites in many developing countries experience continually worsening pollution problems, and the export of pollution preventing equipment and technology assumes considerable scale. (1988)

An independent service industry which possesses high level of preventive maintenance, repair, and ordinary maintenance capabilities of facilities is equipped with large scale transport and information equipment to operate over the whole country and the whole world. (90)

Small turnaround minimill type material plants requiring small capital cost which develop the minimum software in line with the local conditions play large roles all over the country and on foreign soil regardless of whether a leading or developing country is involved. (90)

Large plants to be constructed to exploit the scale merit and combinat effects which first need to be sited will become fairly common at on-sea sites provided with raw material yards and utilities. (94)

Large structure module technology and on-sea construction technology are promoted to construct high rise on-sea plant building groups in Tokyo Bay and Osaka Bay for which large quantity of steel is used. Special steels become important. (03)

2. Siting innovations--Construction of steelmaking plants anywhere on land and within the present industrial belts is very difficult, and the following sites are being eyed. On-sea, underground, remote land, and foreign sites.

Industrial sitings are made in Hokkaido, Kyushu, northern Tohoku and outlying islands, and the import and transfer of raw materials and goods will be through the use of harbors which are developed independently. (91)

High level educational and entertainment service is provided through the communication and broadcast artificial satellite for the benefit of business personnel assigned overseas and their families. (92)

There are units other than businesses which have sited a number of industries overseas and have gone into a number of countries to engage in worldwide industrialization, and the satellite communication mode will be used to establish 24-hour management system directed from the headquarters. (95)

The sea surface in areas where the waves are relatively small is made even more tranquil by the installation of a wavepower power plant, and oil storage sites and steelmaking plants are placed within this perimeter. (99)

Because of developments in efficient survey of underground deep strata and in excavating and construction technology, the economic underground siting of production facilities such as storage facilities, energy facilities, and steelmaking plant are greatly facilitated. (99)

Layer structure module technology and sea construction technology are encouraged, and high rise on-sea factory building groups are sited at convenient sites geographically speaking such as in Tokyo Bay and Osaka Bay to serve medium and small industries. (03)

3. Raising quality of goods to middle and high class--Heat resistant materials, corrosion resistant materials, fatigue resistant materials, strength materials, seawater resistant materials, and low temperature resistant materials will be targeted to provide the country greater international competitive edge and improve the add-on value.

The preparation of high strength and toughness steel by the combination of interatomic exchange of the same family elements such as steel, Ti, and Co and precipitation becomes practical. (86)

Cast iron material with a transition temperature of around minus 100°C is developed, and the use of such material makes possible the transport of liquefied gases through pipe lines. (89)

Steel will be developed based on plastic induced transformation theory with tensile strength greater than 250 kg/mm^2 and elongation greater than 25 percent. (89)

Development of time effective mold steel even better than HrC 60 in the area of forging molds or the same molds are made by development in fast finishing method of steel for rigid mold. (90)

Development of austenite steel in which there are absolutely no stress corrosion cracks. (93)

Heat resistant metal that can be mass produced and which has creep rupture strength of 5-6 kg/mm^2 after 100,000 hours at 1000°C is developed. (93)

Development of machine production material (steel, cast iron, or their replacements) which has elastic modulus 2-3 times greater than presently used material and about the same price is developed. (94)

Development of a turbine blade alloy steel which can be used continuously at 1200°C. (94)

Tool material with compressive strength greater than 500 kg/mm^2 and tensile strength greater than 300 kg/mm^2 which does not plate with other metals (the metal to be finished) and stainless steel can be forged at room temperature is used as mold material. (95)

Seawater resistant steel with life of the order of 20-30 years is developed, an on-sea construction method is developed, and on-sea construction of plants becomes practical. (95)

Industrial use of a low temperature steel with Zn in place of nickel is developed. (95)

A material is developed with fatigue strength 10-100 times that of present-day special steel. (96)

Machine construction material (steel and cast iron) with coefficient of thermal expansion about 1/10 or less than the present type material (about 1×10^{-6}) and cost 2-3 times less is developed. (98)

Development of structural steel which has corrosion resistant life of 50 years when used in seawater. (98)

4. Technological improvement--High reliability of material testing and inspecting, improvement in metallurgical facilities, compact steelmaking plants, cast steel products, and automation.

The detection of flaws on the surface or within the bulk of steel during the steelmaking process is performed on-line. (85)

Development of technology to judge simply and with high reliability the strain state of a metal material. (89)

A casting plant becomes equipped at least to the level of today's rolling mill and made automated and unmanned. (89)

The various mechanical properties of a metal are measured simply and nondestructively. (93)

A steelmaking furnace is developed unlike the arc furnace used presently which is a sealed airtight furnace not using vertical graphite electrode to enable precise steelmaking control. (93)

Appearance of compact steelmaking plant (one which reduces the steelmaking to final product stage by at least several steps, introduces automation of each facility, employs continuous processes, and exercises overall computer control). (95)

Development of super precision steelmaking to produce products with precision of ± 0.02 mm in 200 mm. (96)

Plating a molecular layer of noble metal becomes possible to enable production of low cost and corrosion resistant metals of good properties. (99)

5. Technological innovation--Nuclear power steelmaking; continuous steelmaking; super high quality melting method; space metallurgy plant; testing, inspection; ingot making; powder metallurgy.

The internal structure of metal materials becomes directly observable to the atomic order. (85)

Technology is developed to control the dynamic anisotropy of polycrystalline metals according to design. (91)

Production of pipes, plates, and wires directly and continuously from the molten bath. (91)

Establishment of theoretical system which can control fatigue fracture and embrittlement fracture. (92)

Establishment of new formulation theory for new alloys which employs the capabilities of a computer to develop new alloys. (93)

Zone refining using electron beam melting is developed to produce giant masses of high purity material. (93)

Ingot making technology through nonmacro ingot segregation becomes generally applicable. (94)

Bearing materials presently produced by powder metallurgy will be foamed at time of solidification to make cast bearing material (continuous foam in this case). (94)

Control technology is established for the electrically precipitated crystal growth process. (94)

Large products can be made by powder metallurgy. (94)

Any desired component formulation and cross section can be obtained using powder rolling for thin plates and powder extrusion for rods and wires for the production of small volumes of diverse products. (96)

Transition to a direct steelmaking process is finally realized by the conversion from fossil-fuel blast furnaces to nuclear powered steelmaking. (00)

The present batch type pig iron making and steelmaking will be completely continuous to the end, a complete and continuous refining technology from melt to steel will be established, both continuous casting and continuous rolling technology will be connected, and unmanned plant will be developed. (01)

Appearance of space metallurgical plants where super high purity metals, nondislocated metals, and giant single crystal metals will be produced (produced cheaply in giant artificial satellites. (04)

6. Innovations and improvements in raw material technology--Production of coke from ordinary coal and reducing gas from heavy oil are planned.

A major fraction of the synthetic gas used to produce ammonia and reducing gas for steelmaking will be produced from the heavy residual fraction (asphalt) of oil. (89)

A sizable fraction of fresh water supply for the Kanto coastal, Kinki coastal and northern Kyushu industrial belts is supplied by the high level treatment of city sewer water which is the most abundant source of water in the area. (90)

Residual oil fractions such as asphalt and pitch will be widely used as binder for the manufacture of coke from nonsticky coal. (90)

The large quantity of waste heat from nuclear power plants, thermal power plants, and steelmaking plants is utilized for local concentrated heating needs in a type of system that will be used throughout the country. (92)

A waterway project linking the Abeno and Shinno rivers with Tone River will be completed to greatly ease the water crunch in the area (there is need to readjust the water use rights in the concerned prefectures, counties, and villages). (94)

Any kind of carbonized material can be used in the production of coke. (95)

High temperature gas cooled nuclear reactor becomes the central item in an energy combinat of a type several of which are constructed where desalination of sea water to fresh water will become industrialized and become competitive costwise. (96)

Decomposition technology of low quality oil (such as asphalt and pitch) using thermal energy from high temperature gas cooled reactor will become practical, and the products will be widely used as petrochemical raw materials, reducing gas, city gas, and synthetic gas. (96)

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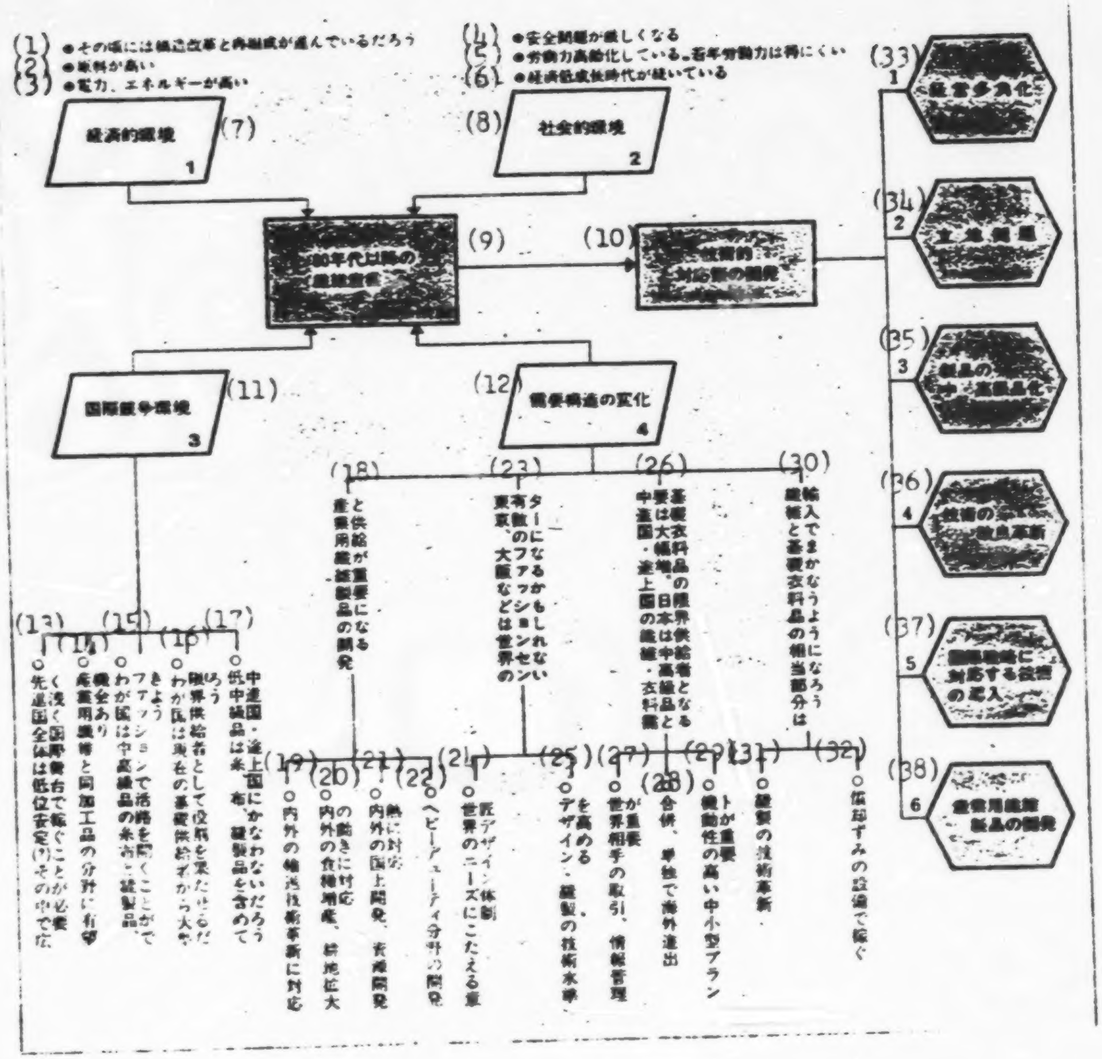
FIBER, CLOTHING MANUFACTURE--FOCUS ON FASHION WHILE MAINTAINING CONVENTIONAL BEAUTY

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 210-212

[Text] The fiber industry of Japan has topped the British Lancashire fiber industry since the last war.

The same situation is now taking place among the various Asian countries today. It may come to pass that a considerable fraction of fibers and basic wearing apparel will depend on imports.

Amortized facilities will be used to satisfy domestic demands while, at the same time, efforts will be directed at developing heavy duty industrial fiber and their products for satisfying the needs of increased food production both domestic and abroad, innovations in transport technology, and resources development. In addition, the latest results of electronic and information technology and machine technology will be incorporated to create innovations in dyeing and sewing while thread, fabric, and tailored products will become products of revolutionary technology to place them in the middle and high quality classes. It may be important to incorporate the classic oriental nature of Japan into the creation of a fashion center in Japan.


(1) ●その頃には構造改革と再編成が進んでいるだろう
(2) ●原料が高い
(3) ●電力、エネルギーが高い
(4) ●安全問題が厳しくなる
(5) ●労働力高齢化している。若年労働力は得にくい
(6) ●経済低成長時代が続いている
(7) 経済的環境 1
(8) 社会的環境 2
(9) 80年代以降の繊維産業
(10) 技術的対応策の開発
(11) 国際競争環境 3
(12) 需要構造の変化 4
(33) 1 経営多角化
(34) 2 立地展開
(35) 3 製品の高級品化
(36) 4 技術の改良革新
(37) 5 国際規制に対応する技術の導入
(38) 6 産業用繊維製品の開発
(18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32)
(13) (14) (15) (16) (17)

Key:

1. Structural innovations and reorganizations will probably have taken place by then
2. Raw materials are expensive
3. High cost of power and energy
4. Safety problems become severe
5. Labor force ages, young labor is hard to obtain
6. Period of low economic growth continues
7. Economic environment
8. Social environment
9. Post-80's fiber industry
10. Development of technological countermeasures
11. International competitive environment
12. Changes in demand structure

13. Leading countries will be in low level stability (?). It is necessary to work far and wide on the international stage in such a setting
14. There are promising opportunities in industrial use fiber and their products
15. Japan will probably be able to make it through middle and high class fiber, fabric, and tailored products. It may also do well in fashions
16. Japan will probably shift from a basic supplier to a large limited supplier
17. Competition with emerging and partially advanced countries in the line of low and middle quality fiber, fabric, and tailored products may be out of the question
18. Development and supply of industrial use fiber products will probably become important
19. Respond to domestic and foreign transport technology innovations
20. Respond to domestic and foreign increased food production and expanded cultivated area
21. Respond to domestic and foreign land development and resources development fever
22. Development of heavy duty area
23. Tokyo or Osaka may become influential fashion center of the world
24. System to provide design to sate the needs of the world
25. Raise standard of design and tailoring technology
26. There will be large increase in demand for fiber and clothing by emerging and partially developed countries. Japan will become limited supplier of middle and high class goods and basic clothing
27. Interaction and information management with the world's customers are important
28. Advance to foreign areas individually and in joint ventures
29. Medium and small plants of high degree of mechanization are important
30. A major fraction of fibers and basic clothing may be imported
31. Technology innovation in tailored products
32. Work with amortized facilities
33. Business diversification
34. Siting problem
35. Production of middle and high class goods
36. Improvement and innovation in technology
37. Introduction of technology to respond to international strategy
38. Development of industrial fiber products

Possible Technological Countermeasures

1. Business Diversification

(1) Advance into chemical industry.

(2) Equipment, engineering.

(3) Advances into service areas on interior design homes, other downstream areas, and clothing.

Coin laundry service to offer good quality washing, pressing, and waterproofing service becomes popular. (1985)

Commercialization of service to take overall control of high class wearing apparel including washing, mending, and storage. (86)

Stores which double as home sewing shops and schools where fairly high class apparel design, cutting, and sewing directions and training are offered while apparel is being put together become common. (89)

Fairly high level tailored products, forming technology, and measurement technology are put together in package deals, firm ware and systematization introduced, and wearing apparel quickly reform at the shop in a type of business that will be offered. (90)

(4) Advances into distribution and multinational registry.

2. Siting Problem

Redevelopment of present factory zones and development of plant parks for medium and small industries are promoted. (91)

Redevelopment of present factory zones and buildings of medium and high rise type are promoted. (93)

Layer building module technology and sea construction technology are promoted, and high rise on-sea factory buildings are constructed for medium and small industries in Tokyo and Osaka bays. (04)

3. Production of Middle and High Class Goods

Production of unsoilable fiber through use of fluorinated resin treatment. (86)

Chameleon fiber which changes color according to light. (86)

Development of synthetic fiber with selective properties (for example, allow air to pass but not water). (87)

Development of fiber with high temperature and moisture adjusting capability. (90)

Solubilizing fiber base and applying it to the production of artificially shrunk fiber become industrialized (development of artificial polymers with properties of natural bond types). (93)

4. Improvement and Innovations in Technology

(1) Fiber base material, fiber raw material technology.

Development of simultaneous extrusion method for multilayered body of synthetic resin and other material. (85)

Development of polymer with superior chemical structural regularity such as the production of regular block polymer. (86)

Production of fiber by the direct polymerization of monomer. (89)

Production is initiated of polymers and elastomers with micro structure, stereo regularity, molecular weight, molecular weight distribution, and branching characteristics according to design. (91)

Silkworms are raised on artificial feed with highly regulated physiology and environment and year-round production. (92)

(2) Weaving and sewing technology.

System for production of made to order and ready to wear clothing in which accurate and efficient measurements of body shape and dimensions are made and patterns (paper patterns) are produced. (81)

General use of computerized weaving machine system. (86)

General use of system in which multiple product variety small product volume lot production is conducted with high productivity with automated color matching, dyeing, pattern selection, and other steps. (87)

Development of system for efficiently producing apparel and clothing in general through multiproduct small volume cutting. (88)

A system which requires the use of high level CAD to make computer model, stereoholography model, and visual plastic model to bring out the product image, model, and functional design becomes necessary and is developed. (89)

System which automates dyeing and all the fabric processings to the finishing stage in automated manner becomes controlling. (89)

Practically all of the Western style clothing is produced by an integrated automated system. (90)

Development of system to enable multiple product low volume production of apparel economically, efficiently, and unmanned wherever possible. (90)

Advancements in automation of production, unmanned technology, remote control technology, repair and maintenance technology, methods of movement control of products and raw materials, and design methods for fabrication and assembly plants, and there is shift from the demerits associated with dispersed sitings to the general use of dispersed facilities. (91)

General use of completely automated and unmanned system for the production of tailored goods from the weaving and knitted stage to finishing, inspection, and packaging. (92)

Industrialization of fiber base synthesis. (99)

(3) Development and introduction of technology to open up entirely new industrial opportunities.

Tokyo becomes one of the world's fashion centers. (90)

A business which combines long term resident leisure facility with on-site training in production, weaving, and dyeing processing of clothing raw materials becomes popular item around the country. (90)

Developments in information processing, measurement, and communication technology and their low cost make possible real time service for supplying high class made to order clothing, orders such as pretapolte, basting, and buying be conducted at remote sites (even internationally). (93)

Course which directs ordinary citizens and youths to learn apparel making from raw material through dyeing, weaving, cutting, and sewing is offered by industries and public organizations. (94)

A service to supply by prearranged production natural materials, fiber, and fabric for wearing apparel is industrialized. (95)

System for the production of clothing which the consumer himself designs is established using automated equipment. (97)

(4) Upgrading production and distribution technology.

General use of long business hours stores where daily use clothing such as underwear are sold through a number of automated vending machines dispensing large number small volume products. (84)

POS is used to acquire, wholesale, and store goods for department stores, regular chains, and voluntary chain type large and small business groups of local nature which are found over the whole country. (86)

Recognition of the need to conserve on packaging and transportation costs leads to the rapid development of pallet pools and container pools used by businesses all over the country. (87)

A computer system to take care of all the steps from order receipt, design, production, and sale is introduced, and an order-made flow production mode is established. (87)

Development of a manipulator with feel which alters its method of handling according to the surface, weight, and shape of the item to be handled. (88)

A business which offers utility service to provide storage, distribution centers, and packaging stations for medium and small wholesale businesses and small retail stores expands quickly. (88)

A service which replaces many of the side roles of medium and small wholesale businesses and small retail stores is offered. (88)

The introduction of POS type service will increase to buy, sell, modernize storage management, demands for rationalization, and need for market predictions even for stores with numerous outlets in a given region. (88)

Eyes for robots (the ability to identify an object once said object is pointed out) are developed. (89)

Standard specifications are set up for large volume consumption materials such as processed foods, sundries, and basic clothing, useless crosshauling is avoided, and information controlled handling, and information handled sales assume considerable scale. (89)

Products packaging module and package types are covered by national specifications for the principal market groups, and standardization of packages, package containers, and packaging machines is increasing. (90)

Development of facility in which a process phenomenon is caught in a camera eye pattern, this is identified and recognized, and a countermeasure is indicated (completely unmanned process). (91)

An automated line is formed from machines which have self-repair capabilities. (98)

5. Development and Introduction of Technology To Counter the International Strategy Age

Development of electrical transmission of colored figures and color photographs (good color quality similar to that of present color prints). (85)

Considerable use of a service business which makes total or partial takeover of market surveys both domestic and foreign and conducts field tests or market tests of test products. (85)

Considerable use of a service which efficiently conducts before the fact advertisement, propaganda, and publicity strategy. (85)

A system which evaluates the needs of various market levels both domestic and foreign, survey of demands, and analytical services becomes to be regarded more objectively. (86)

A number of businesses or organizations are formed in various areas which make manpower surveys, hire, and train manpower for various occupations involving technical skills is formed. (86)

Survey and research substituting service is industrialized and widely used which integrates and brings to high level the capabilities of market survey companies, public opinion survey companies, and think tanks. (87)

Theory and methodology are developed to grasp quantitatively and dynamically how much resources (funds) need to be allotted to fulfill the needs of the entire society and its various stages both here and abroad and break through restrictions. (88)

Consultation businesses for the repair and maintenance, spot inspection, and direction of plants, capital goods, public goods, and permanent consumer goods both in Japan and abroad play important roles as proposer of directions to improve products, development of new products and customer needs. (89)

A service group on special service craft (automobiles, ships) circulate around the world to provide maintenance service to Japanese made plants, capital goods, and high class permanent consumer goods becomes a common item. (89)

6. Expansion and Broadening of Industrial Use Fiber Market--Conveyer belt, large diameter hose, and space structure membranes and flexible container, material for cultivated fish.

Technological system to develop good quality residential sites from sloping land. (87)

Provide technological aid to highly populated developing countries in the form of water utilization construction, land improvement, agriculture, and infrastructure buildings to help these countries raise their levels of self-sufficiency in the matter of cereals such as rice and wheat. (88)

Placing of large fish growing locales using large float-sink fish preserves at several areas in the seas off Japan. (90)

Technological direction and aid on water utilization construction, soil improvement, agriculture, and infrastructural construction to developing and partially developed countries with wide area and low population density to enable them to produce rice and wheat type products which can be sold to Japan at low cost. (91)

Super large open sea float-sink fish preserves (or rafts) which contain a complete food chain starting from plants to raise large fish (such as tuna) is part of the fish raising system that is developed. (91)

Construction of residential plots by the filling up of seas near large cities takes place over the entire country. (92)

Raw materials and fuels are placed in flexible containers enclosed within a protective frame pushed or pulled by tugboats. (92)

Development of a system to improve soft and weak foundation land cheaply. (92)

About 70 percent of the tender vegetables (those which cannot withstand storage or long distance hauling) are produced within the city and in high rise agricultural building under high level of automation. (93)

Appearance of special agricultural businesses which harvest several crops per year of corn, milo, and barley which are specially bred for Japanese conditions under high degree of control in sparsely settled villages. (95)

Large diameter steel pipe or concrete pipe is buried through which large conveyers transport containers for continuous transport by a goods express. (01)

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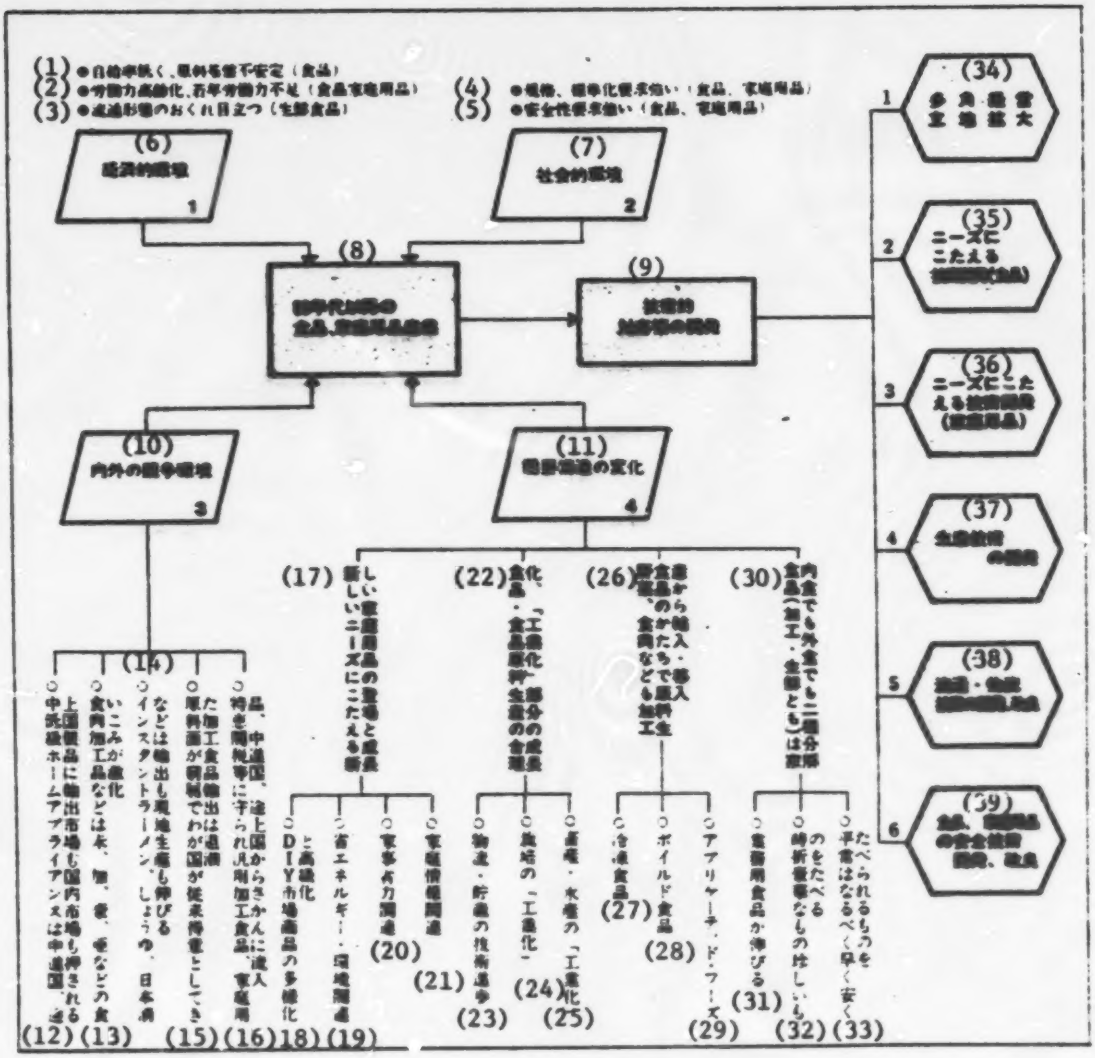
FOOD, HOUSEHOLD GOODS--RESPOND TO DIVERSITY IN EVER RATIONALIZING LIVING ACTIVITIES

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 213-215

[Text] The instability of obtaining raw materials in the food industry and the extreme aging of the labor force in the household goods industries are major problems. Export of middle and ordinary class foods to the middle and lowly developed countries has ceased, imports conversely have increased, and competition with leading countries has increased in the line of middle and high class products.

The food industry is faced with the double polarization of normal use of home food that is processed or fresh which has to be cheap and occasional splurges at some high class outside eating place. The food handled by the industry thereby assumes diverse nature, and research in diversifying the food for industry, rationalization and "industrialization" of food and its raw material production, and production of products that closely fill consumer needs becomes indispensable.

Where household goods are concerned, the development of unique Japanese products to fulfill the needs relative to household information, reduction in efforts associated with household chores, energy conservation, environment, and high level of leisure activities of both short term and permanent nature are necessary.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Key:

1. Low self-sufficiency rate, instability of raw material foundation (food)
2. Aging labor, lack of young labor (food and household goods industries)
3. Backward distribution state stands out (fresh food)
4. Strong demand for specifications and standards (foods, household goods)
5. Strong demand for stabilization (food, household goods)
6. Economic environment
7. Social environment
8. Food and household goods industries in the post-80 era
9. Development of technological countermeasures
10. Domestic and foreign competitive environment
11. Changes in demand structure
12. The home appliance market in middle and newly developed countries and in Japan's home market is finding heavy competition in middle and low class products

13. The use of meat products from the United States, Canada, Australia, and Asia is greatly increasing
14. Instant ramen noodles, soy sauce, Japanese sake, and such processed food export and production in foreign plants in increasing
15. The raw material front is tight, and food products which this country once had been exporting are on the decline
16. Ordinary use processed foods and household goods which had been protected by special duty will be largely imported from emerging and partially developed countries
17. Appearance and growth of new household foods to fulfill new needs
18. Diverse and high class nature of DIY market products
19. Energy conservation and environmentally related items
20. Minimizing efforts in household chores
21. Home information related
22. Growth in rationalization and "industrialization" sector of food raw material production
23. Advances in distribution and storage technologies
24. "Industrialization" of cultivation
25. "Industrialization" of livestock production and seafood production
26. Import and transport of processed foods along vegetable and meat lines rather than production
27. Frozen foods
28. Boiled foods
29. Applicated [phonetic] foods
30. Foods (both processed and fresh) polarize to home cooking or dining out types
31. Business use food is increasing
32. Occasional uptake of fancy foods
33. Normal meals are of the quick and low cost variety
34. Business diversification, site expansion
35. Development in technology to fulfill needs (food)
36. Development in technology to fulfill needs (household goods)
37. Development of production technology
38. Improvement in distribution and material distribution technology
39. Development and improvement in food and household products safety technology

Possible Technological Countermeasures

1. Business diversification, site expansion--Advance into raw material areas in order to assure stable supply of raw materials (food). Expansions of sites--foreign advances will be directed at overseas supply bases for promising products Japan has developed such as soy sauce and instant ramen noodles as well as supply bases to Japan for stable supply of raw materials. Advances in food related equipment and engineering areas.

Developments and improvements are made to promote rapidly plant construction both domestic and foreign and production organization both systematically and technologically (for example, shipboard plants and factory ships which are even provided with utilities for use in developing countries where infrastructure development is way behind). (1987)

Production plants to process foods whose raw materials have seasonal nature will be placed on large trailers or ships in compact and portable manner and moved to the desired locales. (89)

2. Technological developments in response to needs (food industry)--Very convenient and safe processed foods are developed, and higher productivity is proposed. Self-sufficiency rate of raw materials is raised and technology to produce safe and good tasting foods from new and unutilized resources is developed.

Development of large harvest fish as raw material for food material. (84)

Low class fish, fish head, tails, and internal organs which in the past were discarded and constituted environmental pollution problems are utilized for their protein through fixed enzyme or plastin reactions and rendered to tasteless, colorless, and odorless proteins of superior amino acid composition and serve as raw material for processed meat. (90)

Plant proteins (soy bean scrap, gluten) and bacterial protein are used as raw material to the production of high class processed meat with the same amino acid composition, taste, flavor, and feel to the teeth as natural meat. (91)

Chlorella and spirulina type high protein yield alga will be mass produced in facilities for their culture, their protein will be improved by means such as plastin reaction, and the product used as good quality protein material raw material for processed meat. (91)

Development of sex regulating technology for farm animals such as milk cattle and poultry (this may become useful in determining sex of human babies). (95)

Industrialization of sugar synthesis from formaldehyde. (98)

Increase in animal meat and improved food products from animals fed low protein and cellulose type feed obtained from greens which do not compete with vegetables; the food will taste different from today's animal meat. (99)

Industrialization of starch synthesis starting from carbon dioxide gas. (00)

3. Technological development in response to needs (household goods)--Product groups such as household information related products, housekeeping labor-saving goods, energy conserving and environmental safety related group, DIY, and household and time conserving cost type groups.

Development of home use waste disposal machine (solids are compressed, liquids are completely separated from solids). (86)

TV programs can be received directly in homes from a domestic stationary satellite. (86)

The number of appliances to save household labor increases, and the level of automation rises. (87)

Development of comprehensive home information transmission system (TV news, use of computer time sharing). (88)

The design of mass production and large permanent consumer goods and capital goods will take into consideration simplicity in dismantling, reutilization, and conversion to resources of the goods, parts, and materials when these goods reach the end of their useful life after several years. (88)

Industrialization of useful information search, service via telephone made available to individuals. (88)

All waste from urban redevelopment areas and newly developed residential areas are all treated by disposer, sewer system, and terminal treatment plants and used in methane gas production, sludge incineration power generation, and compost fertilizer production in a system which converts the waste to resources. (89)

Systematization of household labor (laundry, telephone answering, cooking, dishwashing, door closings, and air conditioning through a facility that operates in semiautomated manner). (89)

Home air conditioning system using solar energy is developed. (89)

Diversification, modularization, and systematization of equipment to lighten housework are advanced. (89)

Computer programs are drawn up in Japanese very close to the ordinary language. (89)

Improvement in levels of hardware and software that facilitate management of health and health states of homes and their surroundings. (92)

Homes can be built cheaply by DIY approach through open type residential structural units and facility units, and ready rental of cranes and other temporary material and tool rentals. (94)

Comprehensive terminal facility into which diverse information such as ordinary conversation, data, and picture can be input becomes available at low cost. (94)

Solar houses which derive 40 percent of the energy required to heat and cool a home throughout the year will exceed 15 percent of the new residential units (apartments, single family dwellings) constructed every year. (94)

Household management and finances become compulsory educational subjects, and microcomputers and conversational type software will enable any normal boy or girl to learn home management. (98)

4. Development and improvement in production technology--Facility production of vegetables in the area of foods, and "industrialization" is a direction that is a must. Production facilities of household goods particularly assembly processes must be placed in maximum level of automation and unmanned state. Materials with ready fabrication property and high productivity and development of technology to produce such material become important subjects in the area of household goods fabrication.

Development of cheap and strong adhesive which hardens when compressed by a one liquid operation (use of a microcapsule for example). (83)

Development of plastic forming fabrication methods equivalent to powder metallurgy methods. (84)

Development of simultaneous extrusion method of multilayered structure of synthetic resin and other material. (85)

Great advances in mechanization and automation of labor saving operations such as dishwashing for chain restaurants and restaurants and central kitchen systems. (86)

Fabrication and forming of wood powder makes possible the production of items that freely conform to the shape and quality desired. (86)

Development of plastic which is flame retardent and which does not generate toxic gases on combustion. (87)

DIY type service is industrialized to facilitate supply of materials, preparation, and serving of homecooked meals. (87)

"Assembly automation" far above the level of today is established, and automation and unmanned levels of equipment assembly processes are raised far above today's levels. (88)

Standardization and specifications of machines, parts, and plants will be consistent from the country level to industrial plant level, the overall levels will be brought up to those of the United States and West Germany, and Japan's international competitive strength in machines and plants will be greatly enhanced. (88)

Feeding, excreta disposal, and physiological condition assessment will be mechanized, automated, and information processed to the utmost so that one onsite worker will be able to handle more than 300 head of cattle and more than 600 head of hogs through a multiple animal raising plant that will be developed (there is presently a 300 head pilot plant). (88)

Development of synthetic lumber with high moisture absorbing or discharging properties. (88)

Development of leather manufacturing technology without the use of tanning agent. (88)

The level of technology of the food industry undergoes a large rise, and an industry which employs unmanned quality control and multiple product small volume production, efficient production, and highly productive mass production of a level unsurpassed in the world will be developed. (89)

Agricultural enterprises with high degree of mechanized farming and energy conservation are supplied with special seeds and seedlings which are healthy and have been developed under natural conditions as much as possible from agricultural stations established throughout the country. (89)

Growing high-class fish such as prawns and "tai" in large land-based tanks becomes a common business. (90)

Developments in cold chain and transport technology enable a central kitchen located more than 500 km from cafes and restaurants in cities to supply rather high class food and trimmings. (90)

Industrialization of unmanned slaughtering technology. (90)

Forming alloys, particularly alloys with plastic property, by a simple method resembling the injection molding of plastics. (90)

Quality of synthetic lumber, particularly toughness and tenacity are greatly improved, and nearly all such material finds applications and can be supplied and readily fabricated to any desired form to provide material superior to natural lumber. (90)

Industrialization of special high quality fruit orchards which supply various fruits economically the year round through the results of advances in space structure technology which enable the construction of super large hothouses economically and with environmental and physiological control technology using industrial waste heat. (91)

Development of fish growing system consisting of super large on-sea float-sink preserve (or raft) which encloses a complete food chain starting from plankton to be used in raising large fish (up to tuna). (91)

Appearance of completely automated plants where vegetables are grown without soil. (91)

Development of time hardening super plastic alloys. (92)

A service network which offers a wide menu and delivers preordered meals to homes rises up all over the country. (92)

Construction of completely unmanned fermentation plant. (93)

Artificial plants and seedling production for seafood is mechanized, and seafood is plant produced. (93)

Developments in information processing, measurement, and communication technology as well as their low cost enable high class made to order clothing and ordering, basting, and purchasing of pretapolte from great distances (even internationally) through real time service. (93)

About 70 percent of delicate vegetables (which cannot withstand storage or transport) required by a large city is produced in high rise agricultural buildings within the city and peripheral areas where the growth is under high level of automation. (93)

Development of a system to raise breeding stock hogs and cows of high productivity (such as large litters) in short time. (94)

The physiological environment of plants within a high rise farm is controlled and the plants are harvested according to plan in an agricultural mode for the production of fodder, delicate vegetables, and fruits which becomes widely industrialized and model plants for cereals can be provided. (95)

5. Development and improvement in distribution and materials distribution technology--Improvements should be mainly in the system front but there are many areas in the material distribution front that need improvement and development.

Use of wide reaching city system for the promotion of standardization and specification of meat which extends over several prefectures or even over the entire nation through information exchange. (86)

A 1 month's consumption of meat by the entire country will be stored in a super cold freezer economically and without great loss in taste through the development of the proper method and capability to remove the possibility of extreme changes in price. (87)

A system of storing home grown and imported cereals without loss in taste and flavor in an inert gas atmosphere (N_2, CO_2) at low temperature in economical manner will be developed and widely used. (87)

Super self-service stores, convenience stores, and unmanned stores are the objects of pilferage which represents a major problem, and a technology system to prevent such thefts beforehand is developed and improved. (88)

Provision of network of convenience stores and automated unmanned stores which sell processed foods, snacks, and medical supplies 24 hours a day. (88)

6. Development and improvement of safe technology for foods and household products--Starting from equipment to lighten housework, systems, and regulations with emphasis on safety of all appliances that may be used by the general consumer become applicable. (87)

Development of m[illegible] accurately denote the freshness of seafood and the measurement inst[illegible]s used in the process. (89)

Facility to rea[illegible]st the safety of daily use living activity materials or permanent consumer goods with a few words of advice to the consumer making the test is placed in cities, towns, villages, and with self-governing groups. (91)

2267
CSO: 6129/1906

RELATED MATERIAL

Tokyo SHUKAN DIAMOND in Japanese Jan 78 pp 216-218

[Text] Predicted Prevention Technology Against Crime and Aggression

	Subject	Desirability (%)	Materialization period (median number)	Materialization probability
CRIME PREVENTION				
1	Technology development for safe guarantee of information processing system (such as data bank and computer room) which will play more and more important roles will attain higher levels from here on	100.0	1990	0.73
2	Development and improvement of technology to prevent crimes such as invasion of privacy and pilferage of information in and out of the information processing system	98.0	1989	0.73
3	Development of technology system to prevent crimes against cash dispensers and credit cards which are systems tying together information system with fiscal system	98.0	1986	0.76
4	Development and improvement of technology system to forestall robbery of super self-service stores, convenience stores, and unmanned stores	86.0	1988	0.71
5	A security system consisting of arrays of sensors, alarm systems, communication circuits, and computers tied in to a mechanical security system plus a mobile patrol force to prevent illegal entry crimes serving a number of contract customers becomes common practice	96.0	1990	0.71

	Subject	Desirability (%)	Materialization period (median number)	Materialization probability
CRIME PREVENTION (continued)				
6	On-line real time crime prevention system with computerized fingerprinting system and criminal MO data bank subsystem become part of countrywide network	90.0	1990	0.73
7	On-line real time crime information network directed at atrocious crimes and intellectual crimes ties together the major countires of the world through communication satellites	92.0	1991	0.73
PREVENTING INVASION				
1	The entire Japanese homeland is covered with a computer hierarchy system and radar which are activated to provide fully automated early warning system	87.5	1988	0.72
2	Antisubmarine search, discovery, and attack network protects the seas about Japan and particularly ships carrying goods to and from Japan against submarines in time of an incident	64.6	1991	0.67
3	An early warning network functions continuously in time of an incident to guard against intrusion by low flying planes	83.3	1986	0.74
4	A position judging satellite which covers the entire country is launched by which aircraft, ships, vehicles, and individuals can direct lightweight transmitter-receiver to the satellite to accurately assess its position	59.6	1992	0.64
5	Small enemy surveillance robot is dropped behind enemy lines, thanks to improved comprehensive surveillance technology, and computer directed missiles, aircraft, ships and vehicles can be immediately dispatched in the system that is developed	39.1	1997	0.39

Subject	Desirability (%)	Materialization period (median number)	Materialization probability
PREVENTING INVASION (continued)			
6 Comprehensive surveillance technology covering all information media such as sound, light, and radio waves is enhanced and a system for prompt apprehension of attacking missiles, aircraft, ships, and vehicles by computers becomes practical	71.7	1990	0.68
7 A system which constantly tracks enemy radar no matter how much the frequency is changed and jams the enemy radar is developed	63.0	1990	0.67

Direction of Efforts by Japanese Firms in Component Technology Areas

1. Efforts in the following directions are important in the materials area:

   1) Expansion in production, finishing, and utilization of new and strange base materials--various fine ceramics and single crystals for electronics, electric, and machine elements; new metals, engineering polymers, various insoluble enzymes, utilization of bacteria, wide utilization of superconducting materials, wide use of hydrogen as fuel, gaseous fire extinguisher (such as halon gas).

   2) Development of middle and high class materials and substances--high specific strength material, materials with high heat and fire resistance, materials with corrosion resistance, materials with bacterial resistance, materials with low temperature resistance, materials with resistance to seawater, materials resistant to super high pressure and super high vacuum, etc.

   3) Wide use of new and strange manufacturing methods--method of manufacturing uranium and such dissolved in seawater, recovery and utilization technology for deep sea bottom resources, production of grape sugar from cellulose scrap, green leaf protein production, production of single crystals utilizing super high temperature and pressure, manufacture of fine ceramics, bacteria leaching, in-place leaching, wide use of wet metallurgy technology.

2. Efforts in the following directions are particularly important for parts, components, and unit items:

   1) Development and dissemination of parts, components, and unit items displaying epochmaking new capabilities--heat pipe, various sensors, selective absorption-transmission panel for solar radiation, optical fiber communication cable, superconducting cable, various semiconductor components, high performance solar battery, fuel cell, storage battery, super high pressure hydraulic unit, multifunctional building material, high performance ROM and EPROM, spent nuclear fuel cask.

   2) Wide use of new and strange finishing methods--wide use of large energy high precision manufacturing technology such as electron beam, plasma, laser; wide use of high density photographic manufacturing technology, manufacturing technology utilizing super high pressure and super high energy (such as shock waves).

   3) Innovations in assembly methods of parts, components, and unit items--high level assembly technology responding to high level multiple product small volume production, order entry assembly, assembly machine incorporating high level shape and dimension recognition facility, assembly line which successively assembles different products on the same line, development of remote unmanned assembly line group control technology.

3. Efforts in the following directions are important in machine technology:

   1) Introducing artificial intelligence--use of cheap microcomputer and communication equipment. Pediculator [phonetic] machine, robot as a machine with sensory functions becomes widely used, expansion of man's five senses through machines.

2) Expansion in operating range of machines—heterogenizing and use of large parameters in the external environment of machines. Systematized machines with materials resistant to internal pressure, external pressure, corrosion, heat, very low temperature; high degree of unmanned construction; and provided with artificial intelligence.

3) Heterogenizing and use of high parameters for internal environment of machines--nuclear reactors such as high temperature gas reactor and fast breeder reactor, and machine and facility utilizing superconductivity, super low temperature, super high vacuum, super high pressure, or super high temperature.

4) Response to need for energy conservation, and new energy sources--development of machines and facilities to make practical use of solar energy, geothermal, hydrogen, tidal flow, tidal ebb, seawater temperature differential, fast breeder reactor, nuclear fusion type new energy.

4. Efforts in the following directions are important in the system technology area:

1) Tying together and coordinating different systems which are increasing in size and complexity and subsystems of diverse nature--technology for the coordinated and safe operation of diverse subsystems.

2) System with flexibility--in development of component hardware and software, consideration of all stages of design, production, and operation.

3) Entry into system methods and system products of nonindustrial and nonproductive nature--items whi n did not fit into the preliminary knowledge of the system's constitutive sections and to their functions affect the operation, utilization, and profit of the system they can cause unusual incidents or invite confusion and must be given careful consideration.

4) Development and innovations in man-machine interface--it is possible from now on that items which do not possess sufficient preliminary information or training will affect the operation, utilization, and profit of the system and increase the possibility of irregular incidents and confusion.

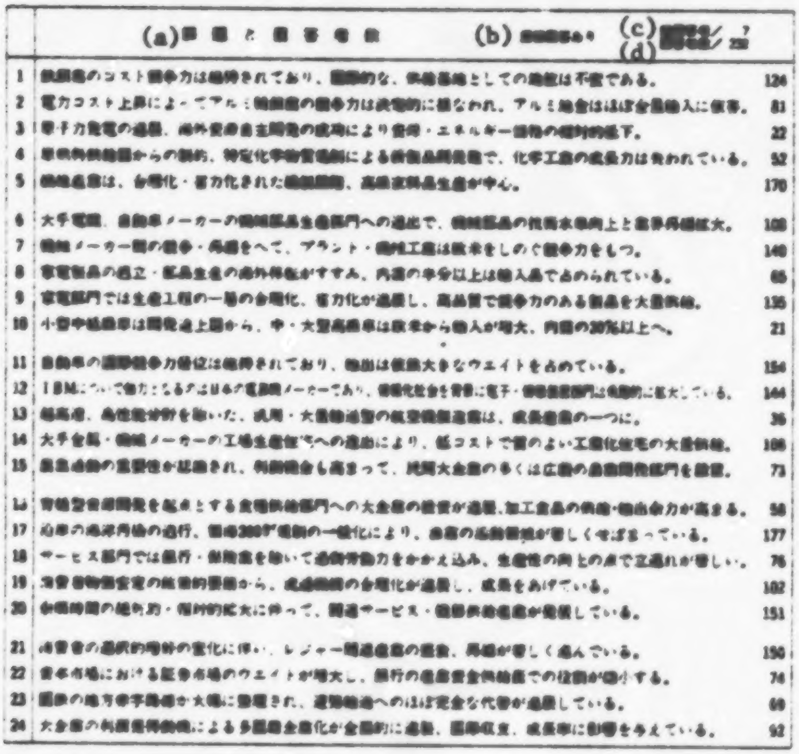
5. Efforts in the following directions are important in the service technologies:

1) Diversity and high quality nature of services--personal and consumer service along with public and social services will quickly diversify, assume higher class, modernize, be rationalized, and made more efficient.

2) Services will become export items--diverse services such as survey-research, design, engineering, construction, consulting, education-training, finance, food, medical, consumer financing become export items by leading service countries and constitute an important topic. International competition in services is a must hereafter, and development of service areas and raising the level and systematizing services become important problems.

3) Technology innovation and development in services--new service development and technological development of hardware and software in all fronts and stages of production, supply, and marketing are important subjects.

Japan's Industrial Structure Will Change in the Following Manner in 1990-2000



	(a) [illegible]	(b) [illegible] (c)/(d) [illegible]
1	[illegible]	126
2	[illegible]	81
3	[illegible]	22
4	[illegible]	52
5	[illegible]	170
6	[illegible]	108
7	[illegible]	140
8	[illegible]	65
9	[illegible]	135
10	[illegible]	21
11	[illegible]	154
12	[illegible]	144
13	[illegible]	36
14	[illegible]	106
15	[illegible]	73
16	[illegible]	58
17	[illegible]	177
18	[illegible]	76
19	[illegible]	102
20	[illegible]	151
21	[illegible]	150
22	[illegible]	74
23	[illegible]	69
24	[illegible]	92

Key:

a. Subject and number of respoudents
b. There were duplications in answers
c. Number not responding
d. Number responding
1. The steel industry maintains its cost competitive strength, and its international supply base position remains unchanged
2. Rising cost of electric power will break down competitive strength in aluminum refining, and aluminum base metal will depend almost completely on imports
3. Developments in nuclear power generation and success in our development of overseas resources enable relative lowering in cost of resources and energy
4. Limitations in the raw material front and difficulty in developing new chemical products because of special restrictions cause the chemical industry to lose its strength for growth
5. The textile industry will concentrate on high quality wearing apparel using highly rationalized and energy conserving sewing operations
6. Large electrical and automobile makers will advance in machine parts production area, and the technology in this area will be improved and the industry reorganized and expanded

7. Competition and reorganization of machinery makers will leave the plant and machinery industry with great competitive strength to withstand Western competition
8. Overseas shift of assembly and part production of household electrical appliances will continue, and more than half the demand will be filled from overseas sources
9. Greater rationalization and energy conservation will be introduced into production of home electrical appliances to enable large volume supply of high quality competitive goods
10. Imports of small and medium class automobiles from developing countries will increase along with that of large cars from Europe and the United States to account for more than 20 percent of the demand
11. Automobile production will maintain its international competitive position, and exports will maintain its weight as before
12. Japanese computer making will be next in line to IBM, and the electronics and information areas will undergo spectacular development with the trend to information oriented society
13. General use and mass transport aircraft manufacturing industry (excepting super fast and high performance aircraft) will be one of the growth industries
14. Advance of large metal and machinery makers into plant-produced homes enable low cost and high quality volume production and supply of industrially produced homes
15. Importance of agricultural production is recognized, the profit picture improves, and many large private firms set up agricultural divisions
16. Large industries put money into the food supply area which is directed at growth type resources development and supply and export of processed food increase
17. Increased pollution of nearby seas and general adoption of the 200 nautical mile limit greatly curtail the activities of the fishing industry
18. The service sector except for banks and insurance companies will have to absorb excessive numbers of people and therefore lag greatly in the area of increased productivity
19. Advances in rationalization of the distribution mechanism due to consumer's demands for price stability policies begin to bear fruit
20. Absolute and relative expansions in leisure time are accompanied by developments in related service and equipment supply industries
21. Changes in consumer's tastes are accompanied by sharp changes in rise and fall as well as reorganizations in the leisure related industries
22. The weight of the securities market in the financial marketplace increases, and the role of the bank in supply of industrial funds decreases
23. Many of the losing operations in local areas of the national railroad are eliminated, and these are mainly replaced by highway traffic
24. Profit making efforts of large firms result in development of internationalized firms on a broad front to exert great influence in the international balance of trade and growth rate

2267
CSO: 8129/1906

END

JPRS 76881

25 November 1980

Japan Report

No. 112

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 76881

25 November 1980

JAPAN REPORT

No. 112

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WHITE PAPER ON NATIONAL LIVELIHOOD ISSUED

OW310230 Tokyo KYODO in English 0208 GMT 31 Oct 80

[Text] Tokyo, 31 Oct, KYODO--The nation's real income dropped over the past year because of the rise in commodity prices and more energy must be conserved at private homes, according to the 1980 white paper on the national livelihood issued Friday.

The paper, released by the Economic Planning Agency said income increased in nominal terms over the one-year period but consumer prices went up more, lowering income in real terms.

Wages for workers at major industries grew 6.72 percent on the average this year, but the consumer price index went up 8.5 percent over the year.

The annual paper said people compensated for their lower buying power by purchasing fewer automobiles, TV sets and other durable consumer goods, and spending less money for tours, movies and other recreational activities.

The decline in real income, the paper said resulted in fewer purchases of houses and some difficulties for those who had bought houses through loans.

The paper subtitled "The Changing Society and How People are Facing It," said energy has been a major concern of people since the 1973 oil embargo.

"The situation will remain unchanged in the future, greatly affecting the national livelihood," the paper said.

It then called for more energy conservation in private homes, noting that about 30 percent of Japan's total energy consumption is used there.

Industries have made greater efforts to cut down their energy consumption than private citizens, the paper said.

More than 99 percent of the oil consumed in Japan is imported.

The paper also noted the cost of education has risen over the past several years but that higher education no longer brings the higher wages and other benefits it used to.

The nation must shoulder a "markedly high cost" for the social welfare of the growing population of aged people, the paper added.

It also said more job opportunities should be created for the aged.

CSO: 4120

MILITARY

MSDF CARRIES OUT TECHNICAL EVALUATION OF GSCC FOR P-3C

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 pp 4-5

[Text]

The Maritime Self-Defense Force (MSDF) carried out technical evaluation of the PGC/SDF GSCC flight programming system for the P-3C antisubmarine patrol aircraft in Tokyo Oct. 8.

The GSCC is a ground support system for use with P-3Cs. The MSDF finalized a ¥1,487.5 million contract with Sumitomo Corp. in FY 1978 to purchase the system from Sperry Univac. Delivery is planned for June 1981.

In FY 1979, the MSDF held three technical evaluation meetings on the system--one in Tokyo and two in the United States. The Oct. 8 evaluation is one of the three evaluation meetings slated for the current fiscal year. Two evaluation meetings are scheduled for FY 1981.

The system will be installed at Atsugi MSDF Base from August to October 1981 after arrival from the United States. Installation will be done by Fujitsu Ltd.

The system will become operational in December 1981 in conjunction with deployment of the first three P-3Cs to be purchased under the foreign military sales (FMS) contract with the United States.

The MSDF has also decided to introduce the passive audio computer (PAC) for ground support of P-3Cs from Sperry Univac. The PAC systems will be produced under license by Nippon Electric Co.

CSO: 4120

JDA PREPARES ANSWERS ON QUESTIONS CONCERNING TAN-SAM

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 pp 5-6

[Text]

The JDA has revealed answers to questions on the domestically developed short-range surface-to-air missile (Tan-SAM), which Keigo Ouchi of the Democratic Socialist Party asked at a House of Representatives Budget Committee session Oct. 11. The Tan-SAM is to be procured by the GSDF and ASDF from FY 1981.

Questions and answers on the Tan-SAM follow:

Q: Can the Tan-SAM be used amid rain or fog?

A: Although the infrared ray homing Tan-SAM will be affected by rain and fog to some extent, there would be little operational problems amid usual rain or fog. Weather will rarely affect operation.

Q: Can the Tan-SAM follow an enemy aircraft in clouds?

A: In general, it is difficult for infrared ray homing missiles to track aircraft in clouds. However, the Tan-SAM will be able to attack aircraft flying in the clouds, although the hitting ratio will be reduced. In fact, the missile hit target drones in clouds during previous tests.

Q: Are there any operational limitations which can be affected by the sun?

A: If the Tan-SAM is launched directly at the sun, its guidance system would be affected. But this will rarely happen. In actual operations, Tan-SAM groups will support each other using additional types of weapons to avoid the sun's effects. Therefore, few problems will arise.

Q: The Tan-SAM leaves a white vapor trail after being launched. Will the missiles' hit ratio be reduced if enemy pilots spot the trail and take evasive action?

A: Even if enemy pilots see the trail, it would be difficult for them to escape the missile attack. The vapor will not be a serious problem regarding operation. In the initial development stage, the JDA considered whether to use smokeless or smoke-producing propellants for the Tan-SAM. The smoke-producing propellant has been selected because of its superior performance.

Q: The Euromissile Roland missile is designed to destroy itself after launching amid dogfights between friendly and enemy aircraft to prevent hitting friendlies. How about the Tan-SAM?

A: There is little time for identifying aircraft or suspending guidance of missiles, when they are used during short-range dogfights. During such action, the missiles will not be launched. The Tan-SAM can identify friendly and enemy aircraft because its selection range is two times greater than the Roland.

Q: Is the Roland cheaper than the Tan-SAM?

A: The Roland's price is about 10 percent less than the Tan-SAM. Considering maintenance and support costs, however, the Tan-SAM is more cost efficient than the imported Roland (end announcement).

Meanwhile, Ouchi's questions included detailed aspects of the JDA's process for decision on the Tan-SAM deployment, leading to speculation that classified JDA documents had been leaked. However, JDA leaders have expressed the view that the speculation is doubtful because no evidence has been found indicating leaks.

CSO: 4120

MSDF RETAINS MINESWEEPING HELICOPTER PROCUREMENT PLAN

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 pp 6-7

[Text]

The MSDF has made no changes in plans to procure six minesweeping helicopters by the end of FY 1984 or the FY 1980-84 Medium-Term Defense Program (MTDP), although it will not dispatch a mission abroad for selection of the helicopter, which had been scheduled for FY 1981.

The helicopters are designed to replace present seven V-107s, which will become obsolete from FY 1985.

Since the MTDP envisages procurement of six new minesweeping helicopters by the end of FY 1984, the MSDF had made plans to send a survey mission abroad in FY 1981, select the new helicopter in FY 1982 and procure four in FY 1983 and two in FY 1984, according to informed sources. It intends to select a large helicopter to use advanced minesweeping systems for efficient operation.

Replacement of the V-107 helicopter is not only being considered by the MSDF but also the GSDF and ASDF. The MSDF is believed to have delayed dispatch of the survey mission since TR&DI research into ways to lengthen the V-107's use, have led to the possibility of the V-107 being operated beyond FY 1985.

However, the MSDF is expected to take some action alternative to the dispatch of the survey mission because emphasis should be attached to advanced minesweeping capability rather than lengthening of the V-107's life. By taking such action, the MSDF apparently intends to procure six new minesweeping helicopters by FY 1984 as originally planned.

CSO: 4120

SJAC COMMISSIONS 12 FIRMS TO UNDERTAKE 15 R&D SUBJECTS

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 pp 1-3

[Text]

The Advanced Aircraft Technology Development Center of the Society of Japanese Aerospace Companies (SJAC) has commissioned 12 companies, including Kawasaki Heavy Industries Ltd., to carry out 15 research and development projects for FY 1980 ending in March 1981. The 12 firms have been selected by the center's Planning Committee through open tenders.

The projects and the companies follow:

(1) Helicopter blades made of composite materials: Kawasaki Heavy Industries Ltd. (KHI). Experimental rotor blades for a smaller-sized helicopter will be designed and fabricated using composite materials for dynamic characteristic tests.

(2) Fiber-reinforced metal (FRM) composite materials: Mitsubishi Heavy Industries Ltd. (MHI). Raw materials and forming processes will be studied for a FRM composite material which can help lighten airframes and engine parts.

(3) Composite material processing methods: Fuji Heavy Industries Ltd. (FHI). Composite materials will be cut and perforated by laser for studies of processing methods.

(4) Processes for machining lightweight integral structures: MHI. Integral aircraft structures without rivets and doublers can lighten aircraft and reduce machining work and cost. Processes for machining titanium alloy structures such as rear fuselage sections, fittings and doors, will be studied. They will include plastic processing, diffused junction, high-temperature and equal-pressure processing. Application to materials other than titanium alloy will also be studied.

(5) Finishing of wide and long fuselage skin: Kobe Steel Ltd. Grinding technology for polished-quality skin of large passenger aircraft will be studied.

(6) Development of highly rigid aluminum alloy: Kobe Steel, Sumitomo Metal Industries Ltd. and Furukawa Aluminum Co. Research on methods to increase rigidity of extra super duralumin aluminum alloy with no effects on extensionality will be carried out.

(7) Elastic wing structures: FHI. The aero elastic tee rolling process will be studied for elastic wing structures.

(8) High-temperature and high-load turbines: Ishikawajima-Harima Heavy Industries Co. (IHI). Static blades of high-performance air-cooled turbines will be designed and fabricated for research on monocrystal blades to increase turbine performance during high temperatures and long running hours.

(9) Engine combusters producing less nitrogen oxide: KHI. Combusters producing less nitrogen oxide will be designed, fabricated and tested.

(10) Variable pitch structures for high-speed propellers: Sumitomo Precision Products Co. Technical data will be collected on lightweight, compact high-powered variable pitch structures necessary for high-speed propellers and their control characteristics.

(11) Hydrogen fuel burning engines: IHI. Technology will be studied for effective burning of hydrogen producing less nitrogen oxide pollution. Experimental combusters will be tested.

(12) Automatic pilot systems: Japan Aviation Electronics Industry Co. Research and design will be conducted on compact, highly reliable, flexible low-cost systems integrating automatic pilot systems, flight direction systems, attitude control systems, navigation guidance systems and engine fuel control systems.

(13) Optical fiber data processing systems: Fujitsu Ltd. Besides basic system tests, experimental fabrication models of data processing devices using optical fiber will be studied.

(14) Navigational systems: Nippon Electric Co. Systems will be studied for determining three-dimensional speed vectors, altitude, attitude and other flight data.

(15) Cockpit display devices: Shimadzu Seisakusho Ltd. Studies will cover display elements such as CRT, PDP, EL, LC, and LED as well as display formulas including direct and reflection display.

CSO: 4120

ECONOMIC

AVIATION ELECTRONICS TO PRODUCE P-3C ALTIMETERS

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 p 3

[Text]

The Japanese Defense Agency (JDA) has appointed Japan Aviation Electronics Industry Co. as prime contractor for license production of radio altimeters for Lockheed P-3C antisubmarine patrol aircraft. The first order for 10 sets will be awarded in March 1981 with delivery planned to start in the latter half of 1982.

JDA has concluded contracts to import three finished P-3C airframes from Lockheed Corp. and have KHI produce five under license. The first order for imports was placed in FY 1978. The second order due out this fiscal year is for local license production.

The APN-194 altimeter for the P-3C was developed by Honeywell Inc. Japan Aviation Electronics signed a contract with the US firm to receive technical assistance in the autumn of 1979.

JAEI has been manufacturing this type of altimeter since 1968. It intends to increase production of such altimeters for commercial aircraft as well in the future.

CSO: 4120

ECONOMIC

JDA ORDERS SECOND AIS FOR F-15

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 p 4

[Text]

The JDA's Central Procurement Office has concluded a ¥5,515 million contract with C. Itoh Aviation to import from Bendix a second avionics intermediate shop (AIS) for testing electronic systems installed on the McDonnell Douglas F-15 fighter. Delivery is planned for February 1983.

The Air Self-Defense Force (ASDF) plans to purchase three AIS systems initially for Nyutabaru, Chitose and Hyakuri Air Bases where F-15 fighters will be stationed. The first AIS order was placed in September 1979 through C. Itoh Aviation. The third is planned for FY 1981 starting in April 1981 with a budget request already submitted to the Ministry of Finance.

The first AIS will be delivered to the ASDF in three installements from June to August 1981. Assembly and coordination will be carried out by ASDF.

Although ASDF intends to procure several more AIS systems, no definite purchase schedule has been prepared.

MHI, the prime contractor for license production of F-15s, received an AIS system last June through Nissho Iwai Corp. and McDonnell Douglas Corp. It is installed at MHI's Komaki Minami Aircraft Works.

CSO: 4120

ECONOMIC

ECONOMIC CHIEF SEES EVENTUAL LOWERING OF DISCOUNT RATE

OW240315 Tokyo KYODO in English 0254 GMT 24 Oct 80

[Text] Tokyo, 24 Oct, KYODO--Toshio Komoto, director general of the Economic Planning Agency, reiterated Friday the Bank of Japan should eventually lower the official discount rate to 6.25 percent per annum.

Meeting the press after the day's regular cabinet meeting, Komoto said that, following the anticipated cut early next month, the official discount rate should be reduced further to the level prevailing before last 19 February.

The Central Bank raised the base interest rate by 1 percentage point to 7.25 percent per annum on 19 February following the previous increases to tighten credit in face of inflationary pressure mounting at that time.

The bank increased the rate further by 1.75 percentage points to 9 percent per annum last 19 March but the two increases were "emergency" measures taken to beat inflation, he said.

Now that prices have begun to stabilize, the official discount rate should be lowered to the level before February to prop up sagging business activities, Komoto said.

Komoto made a similar statement at a meeting of his faction in the ruling Liberal-Democratic Party.

Komoto said he did not think the reduction of the official discount rate cut to lead to depreciation of the yen against the U.S. dollar.

CSO: 4120

EXPORT CONTRACTS OF LEADING FIRMS REACH RECORD HIGH

OW290831 Tokyo KYODO in English 0810 GMT 29 Oct 80

[Text] Tokyo, 29 Oct, KYODO--Export contracts concluded by 13 major Japanese trading houses hit an all-time high in September due chiefly to major plant export deals with Mideast countries, the Japan Foreign Trade Council reported Wednesday.

The council said that their export contracts totaled a record yen 2.3 trillion, up 31.2 percent over the previous year, and import contracts yen 2.1 trillion, up 39 percent. The import total was the second largest on record.

The large increase in exports was ascribed to plant exports to Mideast nations, totaling yen 1 trillion.

The increase in imports was due to a sharp increase in crude import contracts.

Another major factor is the long-term import contract for pulp chips from the U.S.

The council said that the undertone of imports is basically weak.

The 13 members of the council normally account for some 60 percent of Japan's total trade.

As a result, the trade surplus in September was yen 195.8 billion. Export contracts surpassed import deals for the second straight month.

In the export sector, autos rose 62.6 percent. Exports of oil refinery and fertilizer plant equipment to China, Southeast Asia and the Middle East gained conspicuously.

Fuel imports rose by 82.4 percent, due to a sharp increase in crude oil imports from Southeast Asia and the Middle East.

Imports of coal, iron ore and logs were sluggish.

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BRIEFS

AUTO EXPORTS INCREASE--Tokyo, 30 Oct, KYODO--Auto exports hit a September high of 516,289 units last month, up 10.2 percent from the previous month, the Japan Automobile Manufacturers Association said Thursday. The figure was up 29.4 percent over the year-ago level--the previous record for the month. This was the third largest on record after an all-time high of 529,202 last July and the second highest figure of 527,972 recorded in March. Shipments to the United States totaled 188,230 units, a relatively modest rise of 4 percent over a year ago, while those to other major export markets leaped at double-digit rates. Shipments to Europe as a whole jumped 40.7 percent to 107,044, those to the Middle East went up 39.4 percent to 53,136 and those to Southeast Asia surged 26.6 percent to 45,380. Exports in the first half of fiscal 1980 reached a record 3,030,151 units, up 37.8 percent over 2,198,493 in the same period of last year, itself the previous half-year record. Of this total, passenger cars accounted for 2,005,614, up 35.2 percent; trucks for 990,785, up 42 percent; and buses for 33,752, up 97.1 percent. [Text] [OW300837 Tokyo KYODO in English 0756 GMT 30 Oct 80]

PAKISTAN YEN CREDIT--Japan and Pakistan Saturday exchanged notes in Islamabad on Japan's extension of a yen 9 billion credit to help Pakistan purchase 38 diesel locomotives by 1983, it was announced here. The notes were exchanged between Japanese ambassador to Pakistan Tateo Suzuki and Pakistani Vice Minister of Finance and Economy Eijaz Ahmad Naik. The Pakistani purchase plan is part of its railway transport expansion program which includes the buying of 203 locomotives in total, the announcement said. The united yen credit with an interest of 2.75 percent per annum will be repaid in 30 years, including of a grace period of 10 years. [Text] [OW200255 Tokyo KYODO in English 0603 GMT 18 Oct 80]

OIL CONSUMPTION YARDSTICK--Tokyo, 19 OCT, KYODO--Japan will propose a new yardstick for oil consumption to an International Energy Agency (IEA) meeting opening Tuesday in Paris, the ASAHI SHIMBUN reported Sunday. The leading VERNACULAR paper, in a front-page article, said the idea was to relate oil consumption to gross domestic product (GDP) so that efficiency of oil usage could be measured. Government officials said the 21-member IEA has so far set only quantitative petroleum guidelines and ceilings. According to a government survey, IEA members' oil consumption per 1,000 dollars of GDP in 1978 ranged from 0.16 ton to 0.49 ton, averaging 0.33 ton. Japan used 0.26 ton. Japanese representatives to the Paris-based IEA's governing board meeting will also urge removal of obstacles to the development of coal and nuclear power and propose joint investment in the construction of ports, railways and other types of infrastructure in coal producing countries. [Text] [OW200255 Tokyo KYODO in English 0527 GMT 19 Oct 80]

SRI LANKA LOAN--Tokyo, 7 Oct, KYODO--Japan will extend up to yen 3.4 billion in "united" commodity loans to Sri Lanka, the Foreign Ministry announced Tuesday. Related notes were exchanged in Colombo the same day between Japanese Ambassador Kazuo Chiba and Sri Lankan Finance-Planning Ministry's Acting Secretary C. Changmugan, the ministry said. The credit carries an annual interest of 2.75 percent and is repayable over 30 years, including a 10-year grace period. It is designed for purchase of such goods as fertilizers, steel products, machinery, textiles and electric appliances, he said. As a result, Japan has provided Sri Lanka with some yen 65.8 billion in cumulative yen loans since 1966. [Text] [OW100113 Tokyo KYODO in English 0929 GMT 7 Oct 80]

TV PRODUCTION IN CHINA--Tokyo, 17 Oct, KYODO--Victor Company of Japan Ltd. (JVC) said Friday it has completed the construction of a color television assembly line in Tianjin, near Beijing, which is to start operation next Monday. The line, with an annual production capacity of 150,000 14- and 22-inch television sets, is located at the China National Tianjin Radio Equipment Manufacturing Works. In the future, this factory is scheduled to produce 300,000 television sets a year, Victor officials added. Meanwhile, JVC and the China Tianjin fourth administration department will be sponsoring the "1980 Tianjin Seminar for JVC's Technology" this month with the support of the Nissho Iwai group. [Text] [OW171459 Tokyo KYODO in English 0308 GMT 17 Oct 80]

CHINA CREDIT TALKS--Tokyo, 17 Oct, KYODO--China's vice minister of the State Capital Construction Commission, Xie Beiyi, will visit Japan in late October for talks on Japan's yen loans to his country for fiscal 1980, government sources said Friday. Japan is expected to extend yen 55 billion of credit to China for the current fiscal year ending 31 March 1981, compared with yen 50 billion in the previous fiscal year. [Text] [OW171459 Tokyo KYODO in English 0037 GMT 17 Oct 80]

OIL DOLLAR INVESTMENT--Tokyo, 17 Oct, KYODO--Investment by Middle East oil producing nations in Japan in the first 9 months of this year registered a net increase of about yen 10 billion over the same period last year, according to an estimate announced by a leading securities company Friday. Daiwa Securities Company of Tokyo said this amount surpasses the dollar 7.4 billion increase in the countries' investments in the United States in the first half of this year. According to Daiwa's estimate, the outstanding balance of yen assets held by nonresidents at the end of September was equivalent to dollar 58.5 billion, an increase of dollar 20.5 billion since the end of last year. Of this, corporate stocks accounted for dollar 13 billion, up dollar 4.2 billion from 9 months before, corporate and public bonds dollar 19.5 billion, up dollar 4.8 billion, and bank deposits dollar 26 billion, up 11.5 billion. Daiwa said that of the dollar 20.5 billion increase in nonresidents' yen assets in the past 9 months, investments by Mideast oil producing countries accounted for some 50 percent, or dollar 10 billion (yen 2.1 trillion). [OW171459 Tokyo KYODO in English 1254 GMT 17 Oct 80]

WIRELESS PAY TELEVISION--Tokyo, 16 Oct, KYODO--The Posts and Telecommunications Ministry has approved an application by Nikkatsu Corporation for a license to operate a wireless pay television station using ultrahigh frequency waves, a spokesman for the motion picture company said Thursday. Broadcasting facilities are to be built at the Nikkatsu Film Studio in Chofu, Tokyo. Nikkatsu's television broadcasts can be monitored in most parts of Tokyo, and parts of China, Kanagawa and Saitama prefecture. About 5 million households will be able to monitor it, the spokesman said. Nikkatsu was the first organization in Japan to get a pay television license. [Text] [OW161439 Tokyo KYODO in English 0836 GMT 16 Oct 80]

SAUDI-MITSUBISHI PLANT AGREEMENT--Tokyo, 13 Oct, KYODO--Mitsubishi Heavy Industries Ltd. and Mitsubishi Corp. announced Monday they had established joint plant servicing company in Saudi Arabia with local interests. Called Mitsubishi Olayan Machinery Industries S.A., the company will undertake maintenance of industrial plants to be built at (?al Jubaylah). The Mitsubishi companies aid 15 to 20 plant construction projects, including a Japan-Saudi joint petrochemical project, are now being promoted there. The 4 million Saudi riyal (about yen 240 million) joint company is owned 50 percent by Olayan Saudi holding and 25 percent each by the Mitsubishi companies. [Text] [OW150623 Tokyo KYODO in English 1005 GMT 13 Oct 80]

BULGARIAN JOINT VENTURE--Tokyo, 14 Oct, KYODO--Fujitsu Fanuc Ltd. will establish a joint venture company in Sofia, Bulgaria, next March to strengthen after-sale services in Eastern Europe for numerically controlled (NC) equipment for machine tools. The company said the capital and ratio of capital investment for the new venture would be decided by the end of December in talks between Fujitsu Fanuc and Bulgaria. Fujitsu already has an office in Sofia for after-sale service of NC equipment. [Text] [OW150623 Tokyo KYODO in English 0334 GMT 14 Oct 80]

INCREASED FOREIGN SHIPBUILDING ORDERS--Tokyo, 14 Oct, KYODO--The Japan Ship Exporters' Association said Tuesday foreign shipbuilding orders won by Japanese yards in the past 6 months soared, in both tonnage and value. Foreign orders in the April-September period were for 124 ships totaling 2.9 million gross tons, up 25.2 percent from last year. The value of the ships ordered came to yen 554.4 billion (about dollar 2.64 billion), up 54.7 percent. Ship prices were estimated by the association to have increased 25-30 percent from the year before. The association said bulk carriers and tankers were the main types of ships ordered by foreign interests. [OW150623 Tokyo KYODO in English 0323 GMT 14 Oct 80]

COLD WEATHER DAMAGE--Tokyo, 24 Oct, KYODO--Last summer's unusually cold weather afflicted 2.89 million hectares of farmland to cause crops damage of yen 692 million, the Ministry of Agriculture, Forestry and Fisheries said Friday. Ministry officials said this was the worst cold-weather damage to crops, both in space and value, in postwar history. The figures were obtained from a survey conducted by the ministry on 6 October, the officials said. They said the space affected accounted for 52.7 percent of the nation's total farmland. The rice crop was the hardest hit among agricultural products, suffering damage of yen 506.5 billion, which accounted for 73 percent of the total damage, they said. Perishable foods were second hardest hit at yen 78.2 billion, accounting for 11 percent. The ministry has decided to take emergency steps early next month concerned with relief measures, they added. [Text] [OW261609 Tokyo KYODO in English 0101 GMT 24 Oct 80]

PRC LAMP PLANT CONTRACT--Tokyo, 21 Oct, KYODO--Toshiba Corp. and Toshiba Glass Co. have jointly received a Chinese order for a fluorescent lamp plant worth about yen 1 billion (dollar 4.76 milli-n). The companies said the plant will be built in Shenyang, Liaoning Province, to produce 3.2 million 40- and 20-watt fluorescent tubes a year, starting in 1982. The plant will be shipped in December next year, they added. [Text] [OW210603 Tokyo KYODO in English 0133 GMT 21 Oct 80]

U.S. LUMBER IMPORT DISCUSSIONS--Tokyo, 9 Oct, KYODO--A private-level Japan-U.S. committee will be set up shortly to hold discussions aimed at increasing import of American lumber as sought by the United States. This was revealed Thursday by the Japan American Lumber Conference, made up of importers of American lumber. It said the first meeting of the committee is scheduled to be held in Washington as early as in November. Officials of the conference said more than 90 percent of the wood imported from the U.S. is unprocessed logs and lumber accounts for only a small amount. U.S. trade representative Reubin Askew asked the Japanese Government to increase imports of lumber when he visited Tokyo last May. Commenting on the announcement on the formation of the committee, Takao Kameoka, minister of agriculture, forestry and fisheries, said Thursday that he believed discussions conducted by private Japanese and American interests on the matter will contribute greatly to the development of lumber trade. Japanese industry circles believe, however, it will be difficult to increase imports of lumber because house construction methods differ in Japan and the U.S. [Text] [OW100113 Tokyo KYODO in English 0143 GMT 9 Oct 80]

SINGAPORE PURCHASING ORDER--Tokyo, 7 Oct, KYODO--Toyo Menka Kaisha, Ltd. (TOMEN) said Tuesday it had outbid British, West German and Singapore companies to win an order for 1.5 million pieces of metal form and accessories worth yen 4.2 billion from the Singapore Housing Development Board. The engineering and maintenance will be conducted by Nippon Steel Metal Products Co., a yen 5 billion subsidiary of Nippon Steel Corp. The Singapore board will build a specialized yard in connection with the purchase and establish a leasing channel within this year for its general contractors, whose operation will be guided by Nippon Steel Products, TOMEN officials said. [Text] [OW070833 Tokyo KYODO in English 0618 GMT 7 Oct 80]

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MICROTECHNOLOGY OF VLSI, OTHER SEMICONDUCTOR DEVICES

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[Article by S. Namba, Faculty of Engineering Science, Osaka University, Toyonaka, Osaka-Tokyo, Japan]

[Text] This article reviews the microtechnologies used in Japan to produce VLSI (Very Large Scale Integration) and other solid-state devices. The following microtechnologies are covered: electron-beam lithography, X-ray lithography, use of ion beams for pattern transfer, and ion implantation (a method of high precision, playing an important role in VLSI manufacture). The article discusses the basic technical problems and presents some application examples.

1. Introduction

Ion implantation is regarded today as a dependable and precise method of doping, and is used primarily for the manufacture of MOS devices on a Si basis. More than 100 implantation systems are operational in Japan; half of them is used for the mass production of MOS or bipolar LSI and discrete devices, and the remainder is used in industrial and fundamental research institutes. In recent years, the interest in implantation centered on the production of bipolar devices /1/; most recently, attention is focused on heat treatment with laser beams /2/.

Research and development on VLSI devices was carried out over a wide front. Optical lithographic and chemical etching methods were unable to meet the requirements in a variety of aspects; thus, studies have started on new technologies such as electron-beam and X-ray lithography, as well as dry etching methods. Electron-beam lithography offers high flexibility and precision in pattern generation; however, the productivity of the method must be increased. To meet this goal, exposure devices with various beam cross sections have been developed (/3, 4/). Insofar as X-ray beam lithography is concerned, the main problem is the X-ray source of adequate intensity and the mask-fitting procedure. Studies were also carried out on the application of the so-called synchrotron orbital radiation (SOR)/5/.

Although the microtechnologies were developed for solid-state VLSI devices, their application to other devices (such as superconducting switching elements and optical IC elements) has many interesting ramifications.

When producing VLSI devices, we require not only precise pattern drawing but also controllable doping methods. The importance of ion implantation thus continues to increase, and this method is likely to become the most widely used doping technique in the near future. This article discusses those most recent Japanese developments which took place in the field of microtechnologies.

2. Electron-beam lithography

The author drew the attention of Japanese state organs to the importance of electron-beam lithography in solid-state IC device manufacture as early as 1965, and proposed a technological development plan. Although the importance of the plan was acknowledged as the nucleus of the creation of a new technology, the plan was not in accordance with the industrial needs that prevailed at the time. In 1967, the ETL (Electrotechnical Laboratory) and the JEOL (Japan Electro-Optics Laboratory) announced the emergence of the first computer-controlled electron-beam apparatus based on the vector-scan principle (/8, 4/). Hitachi Ltd. later introduced an improved apparatus of the same type on the market. Toshiba (Tokyo Shibaura Electric Co. Ltd.) developed the prototype of an electron-beam system based on the raster-scan principle /9/. The Institute of Physical and Chemical Research recently proposed the application of the square beam with variable cross section. The VLSI Cooperative Lab. and the JEOL developed a system of this type /4/. The JEOL has also announced the development of a system which uses an electron beam of variable configuration /10/. New lithographic equipment was developed everywhere in the world, including Japan.

Table 1 [tables and drawings are reproduced at the end of the translation] summarizes the features of the various electron-beam systems. The vector-scan method has some advantages over the raster method: in the case of small pattern overlap the dead time is short, the positioning of the beam is more accurate, and the proximity effect can be corrected even if fine pattern details are drawn.

The JEOL has developed the electron-beam equipment operating on the basis of the vector scan principle which is presently available on the market and which is computer-controlled. The basic model is the JBX-5A /12/. A slightly modified version of this is the JBX-5B /13/, illustrated in Fig. 1. This apparatus operates at the Solid-State Laboratory of Osaka University. Figure 2 shows the block diagram of the JBX-5B system. The specifications of the system are shown in Table 2. The highly stable single LaB_6 crystal, the cathode of the device, was developed by the University of Osaka and the National Institute for Research in Inorganic Materials /14/. The grids were configured in the PMMA waveguides by direct electron-beam exposure, making use of the phenomenon that the refraction index of the PMMA increases under exposure to electron beams /15/. The Type EB-50 experimental electron-beam apparatus was developed at the ECL (Musashino Electrical Communication Laboratory) for this purpose in late 1976 /16/. Table 3 shows the specification of the EB-50 system. This system uses also a LaB_6 crystal as the electron source, The stability of the high-speed and stable digital-to-analog converter (DAC) of this system is ±7.5 ppm/day /17/. The electron beam is deflected electrostatically. Compensation of the deflection distortions is accomplished with the aid of compensatory data stored in the system, taken by scanning of a calibrating gold grid with the electron beam. The scannable area is 2 mm by 2 mm, the diameter of the beam is 0.35 μm. The accuracy of the pattern size and the positioning is 0.15 μm. This apparatus has been used for the manufacture of 64-kbit RAM and 128-kbit ROM devices /18/. Table 4 summarizes the data for the 128-kbit ROM. The size of the chip is 3.75 mm by 5.5 mm; the size of the memory cell is 8 μm by 7.75 μm. The access time of the ROM is 200 nsec; the output dissipation is 65 mW at a cycle time of 400 nsec. The technology used for the data writing in the 125-kbit ROM is based on technologies such as the new electron-beam exposure system developed at the ECL (1), the high-level wafer technology adapted to the electron-beam lithography (2), and the highly sensitive FPM positive resist developed by the Ibaraki Electrical Comm. Lab. /19/.

Figure 3 illustrates the steps involved in data writing-in by means of electron-beam lithography. First, the diffusion and transistor areas are determined by means of photolithography. Certain transistor areas are defined according to the information to be written-in by means of electron-beam lithography, and then the Al layer is etched away by plasma etching in CCl_4 gas atmosphere. The remaining aluminum layer serves as the mask for the plasma etching of the Si_3N_4 layer made by means of CDV and for the selective ocidation steps that follow, as well as for the boron implantation.

Construction of a 1 k MOS RAM with minimum pattern size of 2 μm has also been completed. It was made by means of direct electron-beam writing-in /20/, using the recently developed EB-52 apparatus /11/. This apparatus is constructed like the EB-50 but it is more accurate and has a higher writing speed. The electron-optical system of the EB-52 is equipped with an afterfocusing unit, and its deflection features electromagnetic means. The apparatus is of the vector-scan type, and is suitable for direct processing of wafers. According to information released, the drawing rate of the apparatus is 60 min/100 mm mask.

The VLSI Cooperative Laboratories developed the Type VL-R1 electron-beam system with raster scan and movable stage (/21, 22/). An LaB_6 cathode is installed in the system. The optical object distance of the electron-optical system is short, so that the current density achieved is more than 300 A/cm^2. This current density suffices for the exposure of the PMMA (polymethyl methacrylate) resist. The pattern of the central processor unit of a 16-bit minicomputer was drawn with the unit (1 μm geometric detail), illustrating the high-density LSI circuits. With a PMMA resist, the drawing rate was 1 sec/chip.

The PMMA resist is widely used because of its high resolution and stability. However, its sensitivity is inadequate. Careful studies were carried out on the characteristics of polymethyl methacrylates with fluorine content (inserted by adding fluorine into the ester chains /19/.) As Table 5 indicates, the hexafluorobutyl methacrylate (FBM) has the highest sensitivity (0.4 μC/cm^2), and it also has a quite high γ value. The heat stability of another member of this family, polytetrafluoropropyl methacrylate (FPM), is better but its sensitivity is somewhat inferior. A pattern resolution of 0.2 μm was achieved with FPM resist, using a scanning electron beam. A highly sensitive (0.5 μC/cm^2) electron resist was developed at Hitachi Ltd. using the copolymer of methyl methacrylate and acrylonitrile [P(MMA-AN)]/23/.

A new positive resist was developed on the basis of poly-α-cyanoethyl acrylate at Matshushita Electric Co. and Fuji Chemicals Industrial Co. The electron sensitivity of this resist is better than 10^{-6}/cm^2 at 20 kV /24/. It has adequate acid resistance against gold and chromium etching agents; thus, it is suitable for the preparation of hard chromium masks and of X-ray lithographic pattern masks.

Theoretical /25/ and experimental /26/ studies have been carried out on proximity effects encountered in electron-beam lithography.

3. X-Ray Lithography

3.1. Characteristic X-Rays for Lithographic Purposes

X-ray lithography appears to be the most promising method for the application of very fine pattern drawings, with detail smaller than 2 μm. But many problems must be still solved before this method is suitable for industrial production in the LSI field. The following are the main problems of X-ray lithography: (1) a high-output X-ray source, (2) a high-precision positioning system, (3) suitably transparent layers for the X-rays, and so forth.

ECL has experimented for a long time before it constructed a high-efficiency system for industrial purposes with a highly accurate positioner /11/. The characteristic X-ray with a wavelength of 0.71 nm is emitted by a water-cooled revolving target consisting of a thin silicon layer over a copper substrate. The silicon layer is applied by plasma sputtering. The maximum output of the electron beam is as high as 25 kW. Table 6 shows the specifications of the system. The X-ray mask that has been developed has a $Si_3N_4/SiO_2/Si_3N_4$ sandwich structure, which is highly transparent in the visual spectral range (80 percent) and has a strength of 0.5 kg/cm^2 /28/. This structure enables the creation of 8 mm square windows. The paper cited under /29/ describes the development of X-ray masks with an Al_2O_3 structure.

3.2. Synchrotron Radiation for X-Ray Lithography

When used for X-ray lithography, the synchrotron radiation has the following advantages: (1) high intensity, (2) variable wavelength, and (3) small radiation divergence. As a result of the high intensity, very short exposure times (in the order of magnitude of seconds) are possible. The possibility of varying the wavelength enables the use of thin organic layers (such as mylar and Parylene N) for the utilization of the higher-wavelength component. The small beam divergence (approximately 1 mrad) creates small semishadow blurring, so that patterns having a large height/width ratio can be copied. We present our results obtained with the electron synchrotron of Tokyo University (/30, 5/). Figure 4 shows the diagram of the Type INS-ES system. The INS-ES electron synchrotron operates at a current of 60 mA at an energy of up to 1.3 GeV. We carried out our experiments at the energy level of 1.1 GeV. We used a gold layer over a silicon membrane as the mask. The thickness of the Si membrane was 3 μm, and that of the gold absorber was 0.4 μm. The reference /27/ describes the method used to make the mask. We used two patterns. One was a line pattern of 1 μm line width. This was made in the conventional lithographic way. The other was a grid with 692 nm period, which was made by means of holography, using a 325 nm wavelength He-Cd laser. The patterns were silicon wafers coated with a 1.5-2 μm thick PMMA layer. There was direct contact between the mask and the pattern, as Fig. 5 illustrates. This system was placed in the direct branch of the synchrotron, in the vacuum space, 10 away from the storage ring (Fig. 4). After the exposure, development with MiBK developer followed. The sample was then immersed for one minute in isopropanol. An exposure time of 20 minutes sufficed with a 3 μm silicon mask to remove the 1.5 μm PMMA layer, at an electron energy of 1.1 GeV and a current of 24 mA. According to calculations, the energy absorption of PMMA corresponds to a value of 2,500 joule/cm^2 under these exposure parameters.

Figure 6 shows the scanning electron micrograph of the grid pattern with a 692 nm period. In this case the thickness of the PMMA resist was 2.2 μm. The observable large height/width ratio shows clearly the high degree of collimation of the synchrotron radiation (divergence of approximately 1 mrad). The case illustrated in Fig. 7 features excellent contrast and perfect synchrotron radiation collimation. The edge of the 0.4 μm Al line mask is smooth, although not vertically walled, while the copied pattern has vertical wall up to the thickness of 1.7 μm. A disadvantage of X-ray lithographic systems operating with synchrotron radiation is the large size of the system and its high cost. It is interesting to examine the extent to which the electron energy could be recuded in such systems. The scanning micrograph illustrated in Fig. 8 shows the image of the pattern with a line width of 0.5 μm copied into a PMMA resist, obtained with synchrotron radiation at an electron energy of 300 MeV. The silicon wafer was etched under the 2 μm thick Parylene N layer containing the patterns. The gold absorber was approximately 0.2 μm thick. The gold layer was etched through that approximately 0.1 μm thick chromium layer which was made by means of the lift-off method after electron-beam exposure and development of the PMMA. Figure 8 demonstrates the very good collimation of the synchrotron radiation at the low energy of 300 MeV. The radiation exposure time of the synchrotron was two minutes. Synchrotron radiation at this low electron energy allows more effective lithographic applications.

4. Etching Technology

The new dry technologies, ion etching and plasma etching, are more flexible and accurate than the conventional chemical technologies. In general, ion etching permits high-resolution pattern transfer in spite of the fact that redeposition of the etched matter, lack of selectivity, and residual damage sometimes does create difficulties. An advantage of this method is that the configuration of the etched pattern can be changed by changing the direction of the bombarding beam. Obliquely walled holographic grids have been made with the aid of this method (/32, 33/), among others. The absolute effectiveness of grids made at the optimum angle was 73 percent at the wavelength of 440 nm and Littrow layout /32/. This is a major improvement over conventional holographic grids.

Figure 9 illustrates the cross sections of GaAs grids made by ion etching in various directions, as well as the intensity ratios of the orders of magnitude of +1 and -1 /33/. It shows clearly the advantages of ion etching.

Figure 10 illustrates a CdTe directional wave coupler, showing a typical application of ion etching /34/. This device was made with the aid of electron-beam lithography and ion etching, as shown in Fig. 11. To achieve vertical side walls and deep etching, the ratio of material to be etched and masking material must be large. This is why aluminum was selected. In addition, smooth edges are left behind if aluminum is chemically etched, without the etching medium attacking the CdTe. Edge-type waveguides with smooth side walls were made in this manner. The smoothness of the side walls is very important because of the low loss of the waveguide.

Plasma etching or reactive-ion etching may be used in those cases where only little damage is permissible and a high degree of etching selectivity is desired. Plasma etching is chemical in character and isotropic; thus, subetching results. The mechanism of reactive-ion etching is physical and chemical in combination. More accurate pattern transfer can be achieved by this method. Problems arising from redeposition can be eliminated with this method also. Flanders and his associates /35/ recently described reactive sputtering of Si and SiO_2 at radio frequency with a high resolution. Reactive-ion etching with d.c. voltage also yields high resolution and vertical side walls. Figure 12 illustrates the scanning electron micrograph of a pattern etched into SiO_2 over a Si substrate. An etching-rate ratio of 8:1/SiO_2:Si was achieved with gaseous C_2F_6 /36/.

Radiation damage arising from ion bombardment increases the rate of chemical etching /37/. The accentuated etching properties penetrate until the ion-penetration depth, and since the lateral scatter of the ions is negligible, the resist pattern can be transferred precisely. We used this method for making $LiNbO_3$ optical waveguides /38/. Figure 13 illustrates a waveguide which was made under 60 keV argon implantation. To achieve the etching depth of 3 μm, the implantation and etching steps were repeated six times.

Figure 14 illustrates the cross section of the waveguide and the mode of the light passing within it. In the case of $LiNbO_3$, neither chemical nor ion etching is practicable. The example shown demonstrates the damaging effects of intensified etching in these cases.

5. Ion Implantation

The following major advantages play a decisive role in the emergence of ion implantation as an indispensable technology: low lateral scattering of the ions so that the implants required can be distributed more reliably and controllably; preimplantation and final implantation ensure high accuracy. Implantation of arsenic and heat treatment with laser became interesting in recent years. The use of channel implantation permits homogeneous and reproducible deep doping /39/. The version of implantation combined with the channel effect was used to make avalanche diodes. The paper referenced under /40/ describes systematic studies on the heat treatment of implanted layers.

5.1. Implantation of Arsenic

The diffusion of arsenic in silicon is concentration-dependent; thus, the result of diffusion is shallow step distribution. This makes the use of arsenic attractive for making emitters for high-speed bipolar transistors, and sources and drains for MOS VLSI devices. Figure 15 illustrates arsenic-implanted profiles /1/. The continuous and the dotted line shows the theoretical distribution calculated on the basis of the model described by Hu and his associates /41/. Agreement between experiment and theory demonstrates the usefulness of the model for arsenic implanted into silicon. The emitter-push effect reduces the influencability of the transistor's h_{FE} parameter and deteriorates the parameters of the transistor. It is a known fact that the emitter-push effect is very significant in the case of phosphorus implanted emitters, while it is negligible in the case of arsenic-implanted emitters. This is also illustrated in Fig. 16. In this case, the base was created by means of boron implantation. According to tests, this emitter-push or -pull effect depends on the width of the base, and its magnitude is 5 to 10 percent of the latter in the base width range of 0.15 to 0.25 μm. Compared to the phosphorus-implanted emitters, the use of arsenic improved the h_{FE}-controllability, the base-collector capacitance, the collector breakdown voltage, and other device parameters. Ultrahigh frequency transistors were made with arsenic-implanted emitter and boron-implanted base. These transistors had an output of 11 W. The efficiency of the transistor collector was 50 percent.

Ion implantation can be easily combined with the self-adapted technology. The self-adapted technology is a typical example of the production of source and drain by means of implantation.

The MOS LSI dynamic memory made by means of this technique has low return current and adequately long refreshment time /42/. This method is also used in bipolar devices with the aim of achieving higher integration. Figure 17 shows an example of this /43/. The emitter, self-adapted with the contact, was made by means of arsenic implantation. The emitter window, the base, and the collector contact are made with a single mask in a single step. As a result, the wafer technology is simple, accurate, and advantageous for achieving higher integration. The h_{FE} scatter of devices made by means of this method was less than 6 percent. This improvement is due to the use of smaller pattern dimensions, arising from the potentialities offered by the self-adapting technology.

5.2. MOS VLSI

The use of short-channel devices is necessary for the manufacture of MOS VLSI devices, both for high integration and high speed.Diffusive self adaptation (DSA) or dual diffusion are promising technologies for the manufacture of MOS VLSI devices /44/. The accuracy of the conventional pre-implantation methods no longer meets the VLSI requirements. Ion implantation and the subsequent penetration technology assures satisfactory controllability for the setting of the threshold voltage and other electric parameters. A dynamic RAM with 60 nsec readout access time /45/ and a static RAM with 56 nsec access time /46/ were made with the aid of these technologies.

There are also available 16-kbit MOS memories on the market, and development of 64- and 128-kbit MOS ROM's is in progress. By using electron-beam lithography, 128-kbit MOS ROM's were made which had an accuracy of ±0.5 microns. Plasma etching was used in the wafer technology to prevent underetching. The threshold voltage was adjusted by means of ion implantation, and the same method was used for delineation of the source-drain areas /18/.

5.3. Heat Treatment With Laser

Heat treatment with lasers is a major research subject. Local heat treatment of small exposed areas is possible by means of this method. Outside of this area, the distribution of the charge carriers is unchanged. For this reason, heat treatment with lasers has potential advantages in the field of microtechnology.

An interesting aspect of heat treatment with lasers is the regrowing rate of the amorphous layers. New metastable alloys with high superconduction critical temperatures (T_c) may be created with the aid of ion implantation, and the T_c may be exactly controlled. This, combined with the potentialities offered by electron-beam lithography, opens up flexible technologies for ion implantation for the preparation of Josephson transitions (weak links). The article referenced under /47/ describes details of applications.

6. Conclusions

Following the successful introduction of ion implantation in solid-state technology, the attention now centers on ion, electron, and X-ray radiation technologies. These technologies include electron-beam and X-ray lithography, ion implantation, and heat treatment with laser.These methods are perhaps not vital for the manufacture of VLSI devices; however, they are dry techniques and such desirable methods for automated manufacture of solid-state devices. Manufacture in the submicron range is useful not only for the production of VLSI devices but also for the development of optical IC's, surface acoustical wave devices, magnetic bubble memories, and superconductive devices. In the opinion of the author, development of submicron technologies represents the most important key factor for the creation of new solid-state electronic devices.

(Translated and edited by Dr. Pal Revesz, KFKI [Central Physics Research Laboratory])

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Figure 1. The JBX-5B (JEOL) electron-beam system
[Not reproduced]

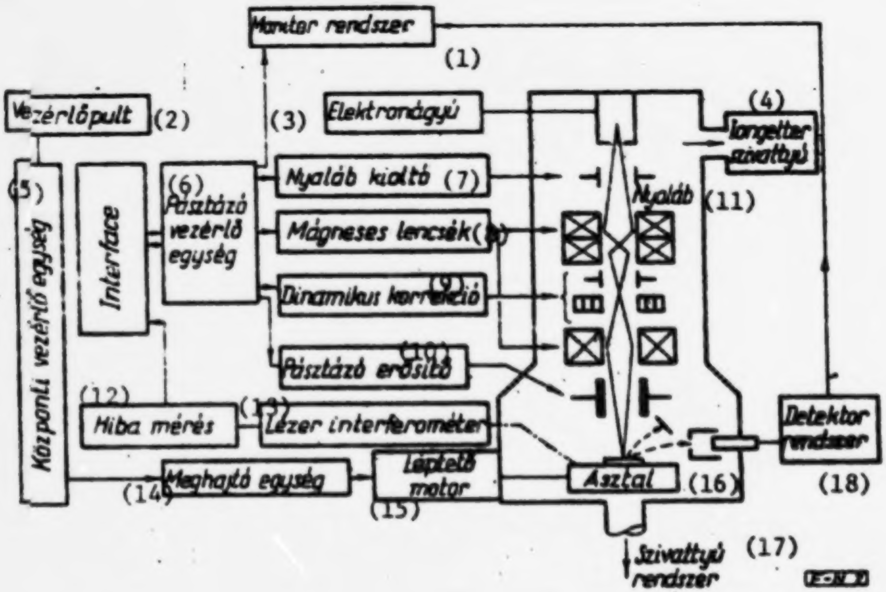
Monitor rendszer
(1)
Vezérlőpult
(2)
(3)
Elektronágyú
(4)
Iongetter szivattyú
(5)
Központi vezérlő egység
Interface
(6)
Pásztázó vezérlő egység
Nyaláb kioltó
(7)
Mágneses lencsék
(8)
Nyaláb
(11)
(9)
Dinamikus korrekció
(10)
Pásztázó erősítő
(12)
Hiba mérés
(13)
Lézer interferométer
Meghajtó egység
(14)
Léptető motor
(15)
Asztal
(16)
Detektor rendszer
(18)
Szivattyú rendszer
(17)

Figure 2. Block diagram of the JBX-5B system

Key:
1. Monitor system
2. Control console
3. Electron gun
4. Ion getter pump
5. Central control unit
6 Scanning control unit
7. Beam extinguisher
8. Magnetic lenses
9. Dynamic correction
10. Scanning amplifier
11. Beam
12. Error measurement
13. Laser interferometer
14. Drive unit
15. Step motor
16. Table
17. Pump system
18. Detector system

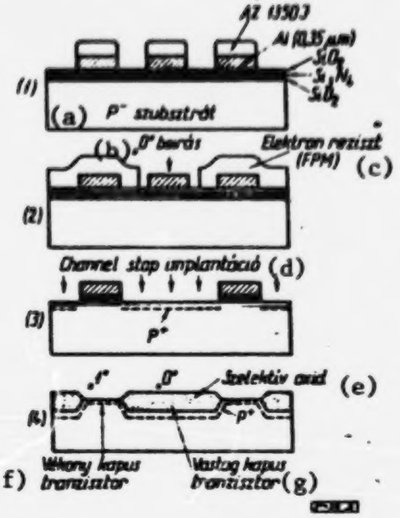
AZ 1350J
Al (0,35 µm)
SiO_2
Si_3N_4
SiO_2
(1)
(a) P⁻ szubsztrát
(b) „0" beírás
Elektron reziszt (FPM) (c)
(2)
Channel stop implantáció (d)
(3)
P⁺
„1"
„0"
Szelektív oxid (e)
P⁺
(4)
(f) Vékony kapus tranzisztor
Vastag kapus tranzisztor (g)

Figure 3. Technological steps of data writing-in

Key:

1. Pattern transfer with the aid of photolithography and Al plasma etching
2. Data writing-in by means of the electron-beam exposure of the FPM resist
3. Plasma etching of the Al and boron implantation
4. Creation of thick-gate electrode at the sites corresponding to logic "0" with the aid of nitride formations and selective oxidation

a. "p" substrate
b. Writing-in of "0"
c. Electron resist (FPM)
d. Channel-stop implantation
e. Selective oxide
f. Thin-gate transistor
g. Thick-gate transistor

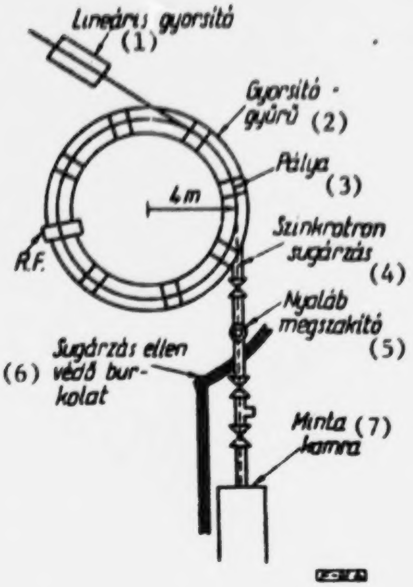
Lineáris gyorsító (1)
Gyorsító - gyűrű (2)
Pálya (3)
4m
Szinkrotron sugárzás (4)
R.F.
Nyaláb megszakító (5)
(6) Sugárzás ellen védő burkolat
Minta (7) kamra

Figure 4. Scheme of INS-SOR
Key:
1. Linear accelerator
2. Accelerator ring
3. Track
4. Synchrotron radiation
5. Beam interrupter
6. Radiation shield
7. Pattern chamber

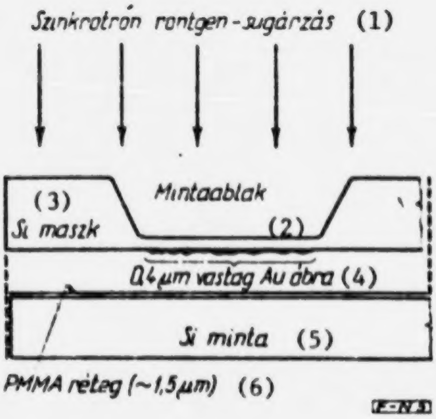
Szinkrotron röntgen-sugárzás (1)
Mintaablak
(3) Si maszk
(2)
0,4 μm vastag Au ábra (4)
Si minta (5)
PMMA réteg (~1,5 μm) (6)

Figure 5. Sketch of the mask and the pattern
Key:
1. Synchrotron X-ray radiation
2. Pattern window
3. Si mask
4. 0.4 μm thick Au pattern
5. Si pattern
6. PMMA layer (∿1.5 μm)

Figure 6. Grid pattern copied into PMMA with the aid of synchrotron radiation (scanning electron micrograph).
Electron energy; 1.1 GeV; λ = 692 mm; line width; 0.2 μm; thickness of PMMA layer; 2.2 μm.

[not reproduced]

Figure 7. The Si-Au pattern mask and its copied image in PMMA obtained with the aid of synchrotron radiation. Electron energy: 1.1 GeV. a) Pattern mask. b) Copied image. Line width: 1 μm. PMMA layer thickness: 1.7 μm; exposure time: 20 min.

[not reproduced]

Figure 8. Scanning electron micrograph of line pattern copied into PMMA with the aid of synchrotron radiation. Electron energy: 300 MeV.

[not reproduced]

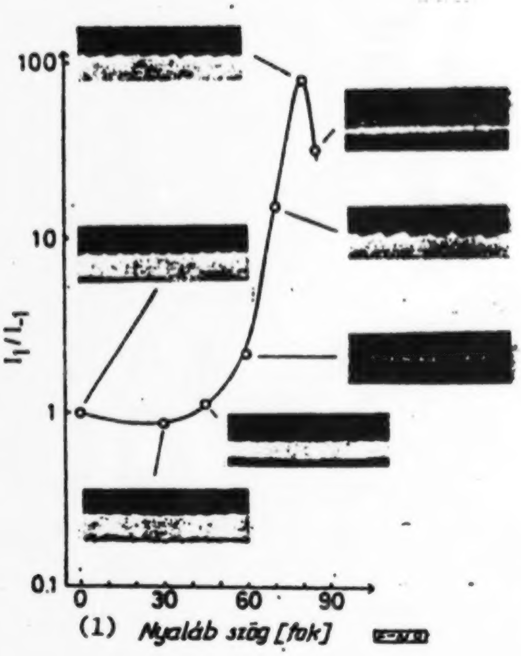

Figure 9. Cross-sectional picture of GaAs grids prepared by means of ion etching at various ion-beam incidence angles, as well as the ratio of the +1 and -1 diffraction values as a function of the incidence angle

Key:

1. Beam angle (degrees)

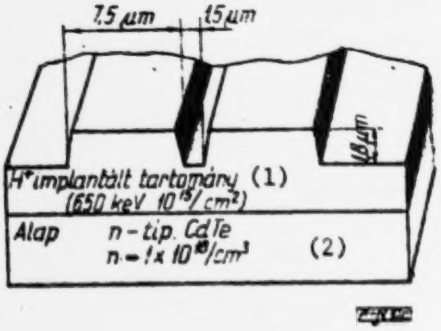
7,5 µm
1,5 µm
1,8 µm
H^+ implantált tartomány (1)
(650 keV $10^{15}/cm^2$)
Alap
n-tip. CdTe
n = 1 x $10^{18}/cm^3$
(2)

Figure 10. CdTe waveguide prepared with the aid of ion etching

Key:
1. H^+ implanted region (650 keV, $10^{15}/cm^2$)
2. Substrate: n-type CdTe, $n = 1 \times 10^{18}/cm^3$

[Photograph in figure not reproduced]

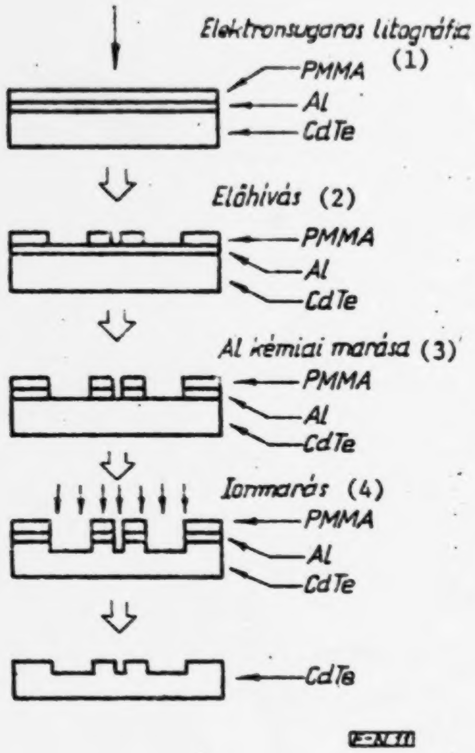
Elektronsugaras litográfia (1)
PMMA
Al
CdTe
Előhívás (2)
PMMA
Al
CdTe
Al kémiai marása (3)
PMMA
Al
CdTe
Ionmarás (4)
PMMA
Al
CdTe
CdTe

Figure 11. Technological steps of the CdTe waveguide

Key:
1. Electron-beam lithography
2. Development
3. Chemical etching of Al
4. Ion etching

Figure 12. Reactive ion etching of SiO_2 over Si at an accelerator voltage of 300 V

[not reproduced]

Figure 13. $LiNbO_3$ waveguide produced with the aid of the speed increase of chemical etching caused by radiation. The implantation was carried out with argon at an energy of 60 keV.

[not reproduced]

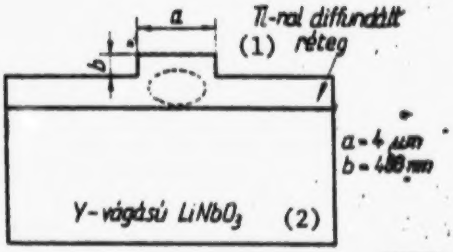

Figure 14. Proximity-space diagram of the $LiNbO_3$ waveguide

Key:

1. Ti-diffused layer
2. $LiNbO_3$, Y-cut

[photograph in figure not reproduced]

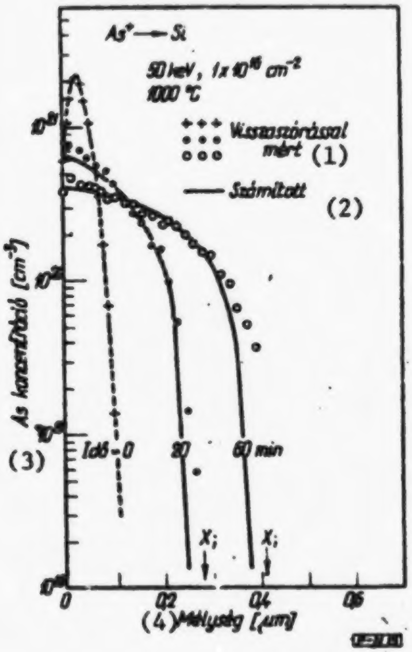

Figure 15. Concentration profile of arsenic implanted into silicon at 50 keV, after 20 and 60 minute heat treatment at 1000°C

Key:

1. Measured by backscattering
2. Calculated
3. Concentration of As (cm^{-3})
4. Depth (µm)

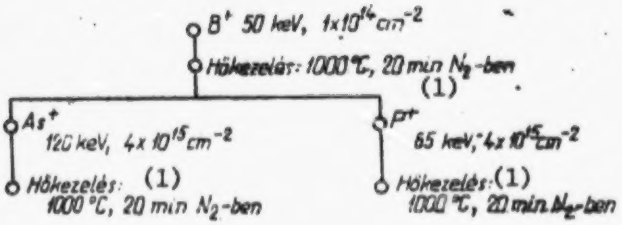
B⁺ 50 keV, 1x10¹⁴cm⁻²
Hőkezelés: 1000 °C, 20 min N₂-ben
(1)
As⁺
120 keV, 4x10¹⁵cm⁻²
Hőkezelés: (1)
1000 °C, 20 min N₂-ben
P⁺
65 keV, 4x10¹⁵cm⁻²
Hőkezelés: (1)
1000 °C, 20 min N₂-ben

Figure 16. Micrograph of emitter transition made by oblique grinding (in the boron-implant base). The emitters were made by arsenic or phosphorus implantation.

Key:

1. Heat treatment: 1000°C, 20 min, N_2

[photographs in figure not reproduced]

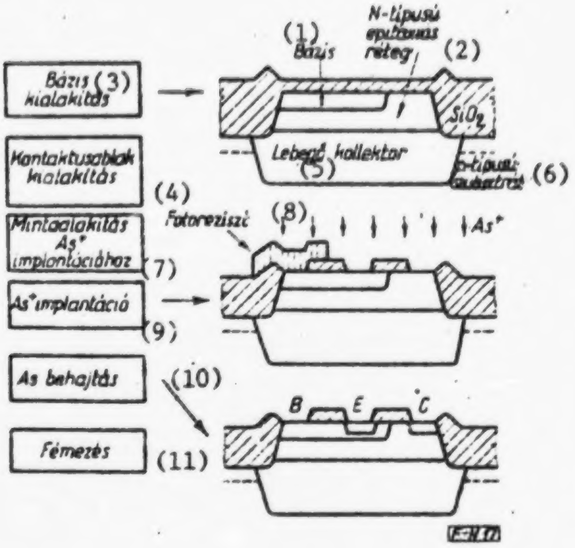
Bázis kialakítás (3)
Kontaktusablak kialakítás
(4)
Mintaalakítás As⁺ implantációhoz
(7)
As⁺ implantáció
(9)
As behajtás
(10)
Fémezés
(11)
(1)
Bázis
N-típusú epitaxiás réteg
(2)
SiO₂
Lebegő kollektor
(5)
p-típusú szubsztrát
(6)
Fotoreziszt
(8)
As⁺
B
E
C

Figure 17. Technology of the implanted self-adapted emitter contact

Key:

1. Base
2. N-type epitaxial layer
3. Base formation
4. Contact-window formation
5. Floating collector
6. p-type substrate
7. Pattern forming for As⁺ implantation
8. Photoresist
9. As⁺ implantation
10. As penetration
11. Metalization

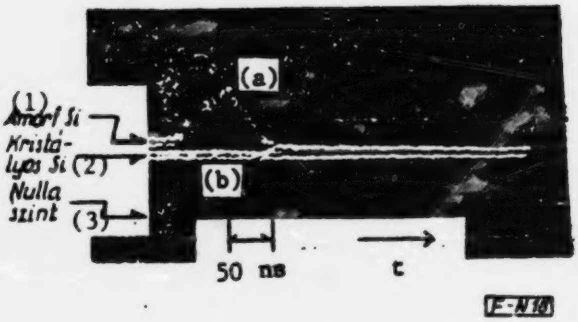

Figure 18. Transient of the recrystallization of the amorphous layer on the effect of the YAG laser pulse. (Implantation parameters: phosphorus 50 keV; 5 x 10^{15} atoms/cm^3.) Other than the transient, there were no changes after the second irradiation.

Key:
a. First irradiation at 5 J/cm^2
b. Second irradiation (at the site of the first irradiation)
1. Amorphous Si
2. Crystalline Si
3. Null level

Table 1. The electron-beam system

Nyalábalak (1)	Gauss-eloszlású folt (2)			(3) Változtatható	
Scan rendszer (4)	(5) vektor		raszter (9)	fix méret (10)	változó méret (11)
	digitális (6)	analóg (7)		(8) vektor/raszter	
Jellemző (12)	nagy pontosság (13)	nagy sebesség (14)	egyszerű eltérítő rendszer (15)	(14) nagy sebesség	
Probléma (16)	komplex eltérítő rendszer (17)		sebesség (átfutási idő) (21)	(18) korrekció a proximitási hatásokra	
	nagy sebességű D/A konverzió (19)	analóg áramkör stabilitás (20)		fix minimális alakzat méret (22)	komplex optikai és vezérlő rendszer (23)

Key:

1. Beam configuration	10. Fixed dimension
2. Spot with Gaussian distribution	11. Variable dimension
3. Variable	12. Characteristic
4. Scan system	13. High accuracy
5. Vector	14. High speed
6. Digital	15. Simple deflection system
7. Analog	16. Problem
8. Vector/raster	17. Complex deflection system
9. Raster	18. Correction to proximity effects

[Key continued on next page]

[Key for Table 1; continued from preceding page]

19. High-speed digital-to-analog conversion
20. Analog circuit stability
21. Speed (transit time)
22. Fixed minimum shape dimension
23. Complex optical and control system

Table 2. Characteristic data of the JBX-5B system

Electron energy	20 keV
Electron current	10^{-12} - 10^{-8} A
Scan area	(A) 500 µm; (B) 1000 µm; (C) 5000 µm
Beam stepping	(A) 0.03 µm; (B) 0.06 µm; (C) 0.3 µm
Scan speed	1.25 - 900 µsec/scan step
Minimum line width	(A) <0.2 µm; (B) <0.4 µm; (C) <1 µm
Geometric distortion	(A) ±0.2 µm; (B) ±0.3 µm; (C) ±0.1 µm
Positioning accuracy	(A) <±0.2 µm; (B) <±0.4 µm; (C) <±1 µm
Beam dimension	(A) 0.05 µm; (B) 0.08 µm; (C) 0.3 µm
Accuracy of line connection	(A) ±0.1 µm; (B) ±0.2 µm; (C) ±0.5 µm
Pattern size	75 mm x 75 mm
Table displacement	75 mm, unit of measurement 0.1 µm
Computer	JEC-980B (up to 64 kwords)
Scanning electron micrograph	1 - 20 kV; 50-30,000 magnification

Table 3. Specifications of EB-50 (ECL)

Acceleration voltage	20 kV
Cathode	LaB_6
Beam current	1 nA
Beam size	0.35 µm
Table displacement	75 mm x 75 mm
Deflection	Electrostatic
Scan size	2 mm x 2 mm
Digital-to-analog converter	16 bits
Stability of above converter	±7.5 ppm/day
Clock frequency	1 kHz - 5 MHz

Table 4. Summarization of the 128K EB-ROM characteristics

Word organization	16 kwords x 8 bits
Access time	200 nsec
Cycle time	400 nsec
Power dissipation	65 mV/400 nsec cycle time
DC supply voltage	+5 V
Cell size	62 μm^2
Chip size	20.6 mm^2 (3.75 mm x 5.5 mm)

Table 5. Characteristic data of fluorinated polymethacrylates (ECL)

Resist	Side-chain structure	Glass transition temp. (°C)	Electron sensitivity (20 kV)	value
FBM	$-CH_2CF_2CFHCF_3$	50	0.4 $\mu C/cm^2$	4.5
A	$-CH(CH_3)CF_2CFHCF_3$	64	6	5
B	$-C(CH_3)_2CF_2CFHCF_3$	84	1.5	3
C	$-C(CH_2)C_2H_5)CF_2CFHCF_3$	73	1	>3
D	$-CH_2CF_2CF_2H$	75	1	>3
FPM	$-C(CH_3)_2CF_2CF_2H$	101	1.5	4
PMMA	$-CH_3$	107	50	3

Table 6. Specifications of the X-ray system (ECL)

Resolution	1 μm
Positioning accuracy	0.1 μm
Exposure area	65 mm diameter
X-ray source	7.1 Å (Si-K_α) 25 kW input
Mask-object distance	400 - 700 mm
Mask-wafer gap	5 - 10 m (±1 μm tolerance)

2542
CSO: 2502

OUTLINE OF XF-3 FAN JET ENGINE

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 pp 7-8

[Text]

The Following is an outline of the XF-3 fan jet engine as announced by IHI, which has been engaged in development of the new engine jointly with the Technical R&D Institute (TR&DI) of the Japanese Defense Agency:

The XF-3 engine project began with fabrication of the prototype XF-3-1 for research in FY 1975 on the basis of research into jet engines of IHI and the TR&DI's Third R&D Center since development of the J-3 engine. Another prototype, the XF-3-20, was fabricated from 1977 to 1978 for testing. Running tests of the two prototype engines now exceed 500 hours. Tests with the XF-3-1 are almost finished. They included rapid acceleration and deceleration, inlet distortion, outdoor noise and low-temperature tests. Tests with the XF-3-20 have been under way since the spring of 1979. Last December, it achieved a target thrust of 1,600 kilograms.

The XF-3-20 has a thrust of 1,600 kilograms, an overall pressure ratio of about 11 and a bypass ratio of about 0.9. Its diameter measures 0.63 meter and the thrust-weight ratio is five to one. The XF-3-20 designed for advanced transonic aircraft, has a compact, high-load transonic compressor and a small lightweight fuel control system. A titanium alloy is used for the fan, the compressor bypass duct and other parts to help reduce weight. New concepts, such as module structures and bore scope checks, have been adopted to help maintenance crews. The engine's high-pressure turbine has a cooling fan allowing the maximum gas temperature to be as low as 1,050 degrees centigrade to increase reliability and future growth potential. The engine also features very reliable hydromechanical fuel controls.

The XF-3-20 is a low-bypass turbofan engine for supersonic and transonic flights. It has two shafts, a low bypass ratio and a nonreheating turbofan. Components include a two-stage axial flow fan, a five-stage axial flow compressor, an annular combustion chamber, a one-stage axial flow and air-cooled high-pressure turbine, a two-stage axial flow low-pressure turbine and a hydromechanical electronic control. The engine consists of fan, core engine, low-pressure turbine, accessory gears, and supplementary modules for ease in maintenance. Instruments for engine checks include the bore scope, SOAP for analysis of lubicating oil, and a magnetic chip detector.

Ongoing and future XF-3 tests will cover ground performance, durability, high-altitude characteristics, environmental flexibility, reliability, safety, maintenance, low-cycle fatigue, pollution and life-cycle costs.

CSO: 4120

DEVELOPMENT OF IMPROVED ASM-1 PLANNED

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 pp 8-9

[Text]

The ASDF/TR&DI plan to start development of the improved ASM-1, a modified version of the ASM-1 antiship missile for the F-1 support fighter, in FY 1982, according to informed sources.

The AAM/ASM-1 missile studies are now shifting to practical deployment from operational evaluation. The improved ASM-1 is designed to an increased destructive power and greater range using a jet engine and a modified guidance system. The current ASM-1 is rocket propelled.

The improved ASM-1 design is similar to the X-SAM-2 antiship missile, which is being studied by the TR&DI at the request of the GSDF as a ground-launched antiship missile. First-stage fabrication of the X-SAM-2 was conducted in FY 1979, followed by second-stage fabrication in FY 1980. Costs totaled about ¥650 million. After continued research in FY 1981, the missile will become an official technical development item of the GSDF/TR&DI in FY 1982, according to the GSDF plan.

Thus, both the ASDF and GSDF are proceeding with technical research into missiles derived from the ASM-1. The ASDF/TR&DI have scheduled the start of the improved ASM-1 development program for FY 1982 to proceed with ongoing GSDF/TR&DI X-SAM-2 research.

CSO· 4120

FINAL TECHNICAL RESEARCH ON NEW MBT FOR FY 1981 SET

Tokyo JPE AVIATION REPORT-WEEKLY in English 29 Oct 80 p 9

[Text]

The TR&DI has requested about ¥200 million for its final-stage technical research on a new main battle tank (MBT) in FY 1981 starting in April 1981. In the final stage, the multiplex structure and system design of the new tank will be studied prior to technical development that is expected to begin in FY 1982.

The new MBT, dubbled Model 88, will be the third-generation GSDF tank following Models 61 and 74. The GSDF hopes to start procurement of the Model 88 in the latter half of the 1980s.

The Model 74 MBT, when developed in the early 1970s, was ranked one of the best tanks in the world. However, its performance has become somewhat inferior to new tanks of major powers. Under the circumstances, the TR&DI must maintain and develop technology for not only tanks but also missiles, electronics systems and aircraft. Regarding tanks, operational requirements center on highly accurate advanced weapons with great destructive power, increased maneuverability and self-defense capability.

Since procurement of Model 74 tanks started in 1974, the TR&DI has been proceeding with research on development of a new tank. Test fabrication and elemental research have so far dealt with the 120mm smooth-bore gun, ammunition, the 8ZG-1200PS diesel engine, armor structure, hydraulic motor, turret guidance system and the chassis, leaving only final-stage technical research for FY 1981. Considering the importance of the final stage, the TR&DI hopes the ¥200 million budget request for FY 1981 will be approved.

CSO: 4120

BRIEFS

COMPUTER MEMORY DISC--Tokyo, 22 Oct, KYODO--A Japanese company announced Wednesday the development of a magnetic computer memory disc with the world's greatest capacity. According to Nippon Telegraph and Telephone Public Corporation, which produced the device, the disc can record 8 years' issues of a daily newspaper, or 160 volumes of an encyclopaedia. Until now, such devices have been comparatively big, so many companies have been trying to make them smaller, cheaper and more reliable. For instance, it is important that they be able to operate non-stop. The company made extensive use of the latest technology in developing an ultra-thin magnetic membrane for storing information. The magnetic disc can contain 2,400,000 bits (binary digits) of information per square centimeter, or claimed to be the largest in the world. The new device thus has a capacity of 3.2 gigabytes, which outclasses the equivalent IBM model, whose capacity is 2.5 gigabytes. One byte, roughly equivalent to one letter or character, consists of eight bits. In addition, NTT has perfected an eight-inch disc. Previously the smallest size was 14 inches. The new device is expected to find extensive applications within the computer field. [Text] [OW221301 Tokyo KYODO in English 1209 GMT 22 Oct 80]

TECHNOLOGY COOPERATION WITH PRC--Tokyo, 17 Oct, KYODO--Mitsubishi Electric Corporation said Friday it has signed a technological cooperation arrangement with a factory in Beijing for manufacturing standard-type motors for export. The 17-month-long agreement, beginning this month, asked Mitsubishi to guide production processes and quality control at the Beijing Electric Motor Factory. Both sides will also exchange technicians. China plans to export some 20 percent of the small-sized motors, produced at the plant, to Southeast Asia. [Text] [OW171459 Tokyo KYODO in English 0208 GMT 17 Oct 80]

SEABED RESEARCH SHIP--Kobe, 16 Oct, KYODO--The nation's first 2,000-meter class sea-bottom research ship "Shinkai-2,000" has been completed at the Kobe dockyard of Mitsubishi heavy industries, Science and Technology Agency officials said Thursday. The 24-ton vessel was constructed to study sea-bottom mineral resources, deep-sea biology and prediction of earthquakes. The National Maritime Science and Technology Center in Yokosuka, Kanagawa prefecture, auxiliary organ to the agency, aims to utilize it starting fiscal 1982. By the end of this year, a launching test will be carried out in a 5-meter-deep water tank in the dockyard in Hyogo ward. A similar sea-worthiness test is to begin January next year, officials said. [Text] [OW161439 Tokyo KYODO in English 1217 GMT 16 Oct 80]

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END

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POLITICAL AND SOCIOLOGICAL

FUTURE OF SUZUKI GOVERNMENT ANALYZED

Tokyo KEIZAI TEMBO in Japanese 15 Oct 80 pp 14-17

[Text] No-Policy Cabinet May Hold Longterm Power With Support of Tanaka, Ohira, and Fukuda Factions

The debate over how long the Suzuki government will last has suddenly become clamorous. Some say that because the chief, Prime Minister Suzuki, lacks sense of direction in policy-making and leadership, the future of the cabinet is hopeless in spite of stable majority support. Others point out that since ancient times there has been a strange custom in Japan of ganging up on and beating down anyone who tries to do a job aggressively. As long as this remains the case, the do-nothing Suzuki cabinet shows signs of a long life.

Unexpectedly Strong Support

This summer, with Minister of Justice Okuno making his statement on constitutional revision and Minister of Home Affairs Ishiba making his statement on introduction of a small electoral district system, the Suzuki government has goaded the opposition parties indiscriminately. With the coming of fall breezes and the approach of an extraordinary session of the Diet, it seems to be putting the sword back in its scabbard. But in any case the prime minister has let his ministers say what they liked as they pleased, and then afterward complained, "That does not reflect my opinion." Many of the people must have wondered, "Does Prime Minister Suzuki have any leadership ability at all?" In addition to this, he showed his lack of understanding toward "politics" in his policy speech at the National LDP Summer Orientation Meeting. Since he is ignorant on policy-making and lacking in leadership, and on top of that, supported by such "great" party members as Tanaka and Nikaido, it is no wonder that the people have been moved to ask, "Just how long will this cabinet last?"

At the same time, we have a strange tradition in this country and there are many instances of some cabinets being knocked down for doing something and other cabinets with prospects of doing nothing unexpectedly long-lived. Therefore there is a tendency of interpreting this situation as the arrival of a long-lasting government.

In any case it cannot be denied that the people feel somewhat uneasy about whether Prime Minister Suzuki is really qualified to be Prime Minister or not. In July, immediately after the Suzuki cabinet was inaugurated, an ASAHI poll showed that public support was 52 percent (with 18 percent nonsupport), the second highest rate of support in history, next to that of the Tanaka cabinet. A YOMIURI poll in August found the level of support to be 48.2 percent (with 25.1 percent nonsupport). This was quite high considering the fact that the poll was taken immediately after a series of controversial statements, such as Minister of Justice Okuno's statement on constititional revision were made.

Nevertheless, when we look at the reasons for support for Suzuki Government, we find that in the ASAHI poll the most common reason, 24 percent, was "because it is an LDP cabinet" and only 8 percent responded "because of its policies". In the YOMIURI poll only 31.0 percent said that the cabinet "has leadership" and 46.9 percent concluded that it "does not". In short, these figures back up the fact that there is little confidence in this cabinet's policies and leadership.

Within the LDP, voices defending Prime Minister were heard from such people as former Prime Minister Fukuda. "It is too cruel to say he has no leadership ability. He's still in the stage of warming up." However, Prime Minister Suzuki has made statements recently that should unnerve these apologists.

Following the steps of his 'teacher' the late Hayato Ikeda, the Prime Minister said "In order to achieve a better understanding of government policy, we must first understand financial matters." At first he was given high marks for his use of figures in his public speeches. Example: "The interest payments on government bonds amount to 12 billion yen per day. While I am speaking to you, 500 million yen an hour is being used up in interest payments." However in the National LDP Summer Orientation Meeting held in September he gave a miserable performance that exposed him as an incompetent leader.

'Political Nonsense' Tries Our Tolerance

For example, he made his greatest blunder in his policy speech, saying, "The rate of dependence on oil for energy in Japan is 7.1 percent. By developing alternate sources of energy we would like to raise this to 50 percent." The correct figure for the rate of dependence on oil is 73 percent. Even if this were kindly interpreted as just a mistake in reading, to say we want to raise the dependence on oil when we are in the process of trying to lower it raises the question of whether he understands the situation at all.

In addition to this, he made a mistake on the goal for this year's real economic growth and, although we depend on imports for 99 percent of our oil, said, "Japan depends on imports from foreign countries for a great deal, 88 percent, of its oil." These mistakes cannot be simply called amusing. Chairman Abe and other members of the Policy Affairs Research Council let them pass at first but eventually had to frown on his [inaccurate] statements.

Inaccuracy in statistics, by itself, may not be fatal, but when debating begins in the Diet, the prime minister had better not repeat this kind of poor showing on issues of great concern to the people such as prices and economic conditions. If he does, confidence in the cabinet will wane and his base will be inevitably weakened. Of course, Prime Minister Suzuki will probably be cautious and as much as possible leave these things up to cabinet members expert in economics such as Mr Komoto, Director of the Economic Planning Agency and Minister of Finance Watanabe. Still, this is a sad situation.

Prime Minister Suzuki has said personally, "I understand that I am criticized for not having firm policies or vision. However, I have been placed in the position of Prime Minister by recommendation. I did not fight for the position by promoting myself as a man of vision. My mission is to carry out the public commitments of the party." In a way, he is going on the offensive. But in another way he is revealing his feelings of inferiority, and admission that he lacks the qualifications necessary to be prime minister.

In addition to the problem of qualifications there is a surprisingly deep split between cabinet ministers of the old Ohira faction which could influence the fate of the Suzuki cabinet. Simply stated, this is the discord between Foreign Minister Ito and Minister of International Trade and Industry Tanaka on the one hand and Chief Cabinet Secretary Miyazawa on the other. The former group was closest to former Prime Minister Ohira and considers the continuation of Ohira policies to be of utmost importance. Miyazawa was outside the mainstream in the old Ohira faction but is right in the center of the new mainstream with the emergence of Prime Minister Suzuki.

When former Prime Minister Ohira died and the problem of his successor was still unsettled, Mr Suzuki worked within the old Ohira faction to support Miyazawa. At that time, Foreign Minister Ito was so much against Miyazawa that he declared, "If Miyazawa is backed [by the faction], I will leave the faction." Within the cabinet as well, this standoff is creating quiet sparks over diplomatic issues. In the recent National LDP Summer Orientation Meeting, Foreign Minister Ito held Chief Cabinet Secretary Miyazawa in check with this statement. "If I push Chira foreign policy forever I will be reprimanded by Mr Suzuki, so we will move to a Suzuki foreign policy before long. But until then let me go ahead with the Ohira foreign policy."

Miyazawa-Ito Discord a Defect

The concept of "Ohira foreign policy" is not precisely defined, but it gives even more importance to Japan-U.S. relations than has the policy of previous governments. The main feature has been to side with the United States when conflict developed between the United States and, for example, Iran and the Soviet Union during the Iran and Afghanistan troubles. This was done even though Japan had to resign itself to cooler relations with Iran and the Soviet Union.

In comparison to this, Suzuki foreign policy is still nebulous. However, Prime Minister Suzuki has a strong relationship with the Soviet Union from fishery negotiations and Chief Cabinet Secretary Miyazawa says, "We will not conduct a foreign policy based on a scheme of Japan, America, and the Middle East against the Soviet Union. Japan should consider Japan-Middle Eastern, Japan-U.S., and

Japan-Soviet relations as separate problems." Therefore, if his posture must be characterized, it can be seen as giving comparatively more consideration to the Soviet Union.

Since the Suzuki government took office, no U.S.-Soviet conflict comparable to the Afghanistan problem has occurred. But if Japan is faced with a situation demanding a concrete response, trouble between Ito and Miyazawa is inevitable. No matter how skilled the prime minister is at creating harmony, this conflict cannot be solved in a simple manner. Leadership will be fundamentally called into question.

Of problems within the party, one that is likely to become a sore spot is the existence of Mr Nikaido, Chairman of the Executive Council. Comparing the three top party officers, the concensus is that Nikaido has a slight edge in power. He has held the posts of chief party secretary and chief cabinet secretary and run the Tanaka faction as a surrogate leader. The Ohira faction has put none of its own people in the top three posts and Nikaido has ambitiously attempted to do the work of the Ohira faction as well as that of his own. In this burst of activity, he has even stuck his nose into the preparation of Prime Minister Suzuki's speech drafts. However, the more Kikaido makes himself visible, the more an atmosphere of suspicion is created. Furthermore, with Tanaka behind him, he is in the awkward position of being suspected even if he is doing nothing wrong.

Since this situation exists, the position of the Suzuki cabinet is ambiguous on the important issue of establishing ethical government. At the first meeting of the cabinet, Prime Minister Suzuki expressed this wish. "It is essential to attempt to reform and purify politics and enforce the discipline of government officials in order to restore the confidence of the people. I would like the ministers to take the initiative in setting an example." But as matters stand, those are empty words. He has done nothing so far about taking action in the case of Dietman Sanpachi Taido (Chiba 1st District) who made news for large scale violations of election rules.

In the upcoming Diet session, the opposition parties will pursue the questions of the series of airplane scandals, the suspiciously tight relationship between Japan and the ROK, in particular the connection between Japanese politicians and the problem of corrupt accumulation of wealth in Korean politics, and also the role of the prime minister in the movement of Kokusai Kogyo President Osano into Iwate prefecture. If the Tanaka forces are effective in blunting a thorough investigation of the truth, the high rate of support for the Suzuki cabinet is bound to take a sharp drop. With the Special Aeronautics Committee in the House of Representatives being abolished and Minister of Justice Okuno letting drop a statement that "the DC10 scandal is now nullified by statute of limitations", there is a good chance that this will happen.

Viewed in these aspects, the Suzuki government is riddled with flaws. But this does not necessarily mean that it will be short-lived. A very comforting development for the Suzuki cabinet was the move of the Fukuda faction to Suzuki's support, forming a three-way coalition of the Ohira (Suzuki), Tanaka, and Fukuda factions. There is a world of difference between this and the Ohira cabinet which alienated the Fukuda faction and operated with the backing of the Ohira and Tanaka factions only.

Strong Three-way Coalition of Factions

It is still not known exactly why former Prime Minister Fukuda, who had previously been so opposed to "Chief Party Secretary Suzuki", turned right around and backed him when the Suzuki cabinet was formed. A minister close to Fukuda recently gave this explanation.

"Fukuda supported Suzuki because of his awareness of himself as leader of the Japanese WASPs (white, Anglo-Saxon, Protestant: characteristics of the U.S. governing class, necessary for such offices as president). Neither Tanaka nor Miki are members of the Japanese version of the WASP class. In the political sphere, only Fukuda or Ohira were connected with the mainstream leaders of other sectors such as Doko and Inayama of the financial community and the late Ichiro Kakayama and Seiji Kaya of the academic community. Now that Ohira is gone, it would not do for Fukuda to be opposed to the mainstream. Of course, to himself, he hoped that his own name would come up. But when it didn't, in order to link up with the next in line among Japanese "WASPs", Shintaro Abe, he returned to the mainstream by supporting Suzuki with the intention of establishing control behind the scenes."

According to Abe, charman of the Policy Affairs Research Council, former Prime Minister Fukuda decided to support Suzuki at an early date, 24 June, just two days after the election. If this is true and he decided to back Suzuki with clear conscience and by design, not just in the course of events, the support of former Prime Minister Fukuda for Suzuki must be seen as the real thing.

Former Prime Minister Fukuda would not recognize Nakasone, director of the Administrative Management Agency or Komoto, director of the Economic Planning Agency, as members of the Japanese "WASP" class and would not want to turn the government over to either of them. It is thought highly likely that his posture of support for Suzuki will continue until Policy Affairs Research Council Chairman Abe is groomed and ready. The supposition that "Fukuda will support Suzuki for two terms, 4 and a half years," is based on the feeling that Fukuda aims to keep the Suzuki government going until Nakasone and Komoto are knocked out of contention.

Naturally the Tanaka faction is not likely to desert Suzuki. So supported by the Ohira (Suzuki), Tanaka, and Fukuda factions, the Suzuki cabinet, although full of weaknesses from an outside view, is strong within the party. Also, it is certain that Nakasone and Komoto will fail to be a threat for some time. Whatever the eventual outcome, continuing developments will bear close watching.

9651
CSO: 4105

SOVIET OFFICIALS TO DISCUSS SIBERIAN PROJECTS WITH JAPANESE

OW170616 Tokyo KYODO in English 0555 GMT 17 Nov 80

[Text] Tokyo Nov 17 KYODO--Senior Soviet officials will fly to Tokyo later this week for talks on Siberian natural resources development projects, government sources said Monday.

This includes the signing of long-pending agreements for Japanese credits for development of forestry and coal resources in Western Siberia, they said.

The Soviet Union reportedly is seeking yen 160 billion [$761.9 million] to yen 200 billion in additional credits from the Export-Import Bank of Japan to finance development of forestry resources and dollar 40 million for development of the Yakutsk Coal Mine.

Under a broad agreement reached last year, the Third Five-Year Forestry Development Program was to start this year, but Western economic sanctions, imposed because of the Russian invasion of Afghanistan, have forced a delay in the Japanese-Soviet joint undertaking.

Under the Second Five-Year Program (1975-79), Japan provided yen 162.6 billion in credits in return for supplies of 17.5 million cubic meters of logs and pulp.

Amid a slump in demand for lumber, however, the Japanese are responding cautiously to the Soviet-proposed new credits.

For development of the Yakutsk Coal Mine, the Soviets first made soundings on the additional credits in October 1979 to finance purchases of coal crushers and other machinery and equipment from Japan.

The seven-man Soviet team, led by Foreign Trade Vice Minister Viktor Mikhaylovich Ivanov, is scheduled to leave Moscow for a week-long visit to Tokyo Tuesday, foreign ministry officials said.

The group will include Foreign Trade Bank Vice President Valeriy Pekshev and Vazha Dzhinozhikhadze, vice president of the Soviet Central Bank, Gosbank, they said.

Although officials of the International Trade and Industry Ministry (MITI) declined to go into detail, the Soviet officials are expected to sound out the Japanese Government on another Japanese financial assistance for construction of a natural gas pipeline.

There was talk the soundings have been made through Japanese trading companies, seeking a soft Eximbank loan of $3 billion for the 4,000-kilometer pipeline to move natural gas from Ob River basin deposits to West Germany, France and other West European countries.

Under a broad agreement reached recently, West Germany has pledged $5.5 billion to help finance the Yamburg Project, which is estimated to cost $10 billion to $12 billion, according to a press dispatch from Moscow.

Despite Japan's sanctions against Moscow, in effect since last January, the Japanese Government is considering extending financial assistance to the Soviet Union on a case-by-case basis, MITI officials said.

With the Japanese credits, the Russians are reportedly planning to purchase steel pipes and other equipment for the project.

The project is included in the new Soviet Five-Year Economic Development Plan for 1981-85.

CSO: 4120

BRIEFS

SOCIALIST PARTY FORMS COMMITTEE--Tokyo Nov 6 KYODO--Leaders of the Japan Socialist Party and three labor organizations agreed Thursday to form a committee for strengthening the party. The three labor bodies are the General Council of Trade Unions of Japan (SOHYO), the Federation of Independent Unions of Japan (Churitsu Roren) and the National Federation of Industrial Organizations (Shinsan-Betsu). All support the socialist party. The agreement was reached in talks between JSP chairman Ichio Asukata and top-ranking officials of the labor organizations on activities to strengthen the party. They also decided to meet periodically for that purpose. JSP representatives explained a draft action plan to be submitted to its regular convention next month and asked the labor leaders to join a committee for strengthening the party, whose preparatory body has been formed by SOHYO. The labor leaders agreed to create the committee, but said that its character and membership should be discussed first by the three organizations. [Text] [OW060551 Tokyo KYODO in English 0538 GMT 6 Nov 80]

JAPANESE CONSTITUTION REFORM--Tokyo Nov 8 KYODO--Some 200 scholars, lawyers, novelists and other intellecturals formed a group here Saturday to resist moves to revise Japan's war-renouncing constitution, while developing peace and democracy. The inaugural ceremony for the "Intellecturals' Congress for Peace and Democracy" was held with about 58 supporters attending. Those present included critic Shin Aoichi, sociologist Rokuro Hidaka, novelist Inako Sata, Honorary Prof. Tsutomu Ouchi of Tokyo University and Prof. Takasuke Kobayashi of Aoyama Gakuin University. Eighteen Diet members, including socialist leader Ichio Asukata, also took part. Ouchi, Sata and Hidaka were picked as coordinators of the congress at its plenary meeting. The formal inauguration of the group came after Prof. Michio Inaba of Tokyo University and others set up a preparatory committee in mid-October. The first meeting agreed to hold a regular session every month to study and carry out ways of promoting their campaign. Kobayashi warned that remarks recently made by Justice Minister Seisuke Okuno are aimed at justifying the gradual amendment of the constitutional law. Asukata proposed that November and May be designated as months to foster peace and democracy. [Text] [OW081203 Tokyo KYODO in English 1146 GMT 8 Nov 80]

CSO: 4120

MILITARY

JDA TO CHANGE METHOD FOR COMPUTING DEFENSE CONTRACTORS' PROFIT

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 5-6

[Text]

The Japanese Defense Agency (JDA) intends to decide on a new method for computing defense contractors' profit ratio to military equipment prices by the summer of 1981. This will be the first change in about 20 years.

Prices of aircraft, destroyers, tanks, missiles and other defense equipment comprise manufacturers' products cost and a certain profit ratio. This ratio has been computed based on the defense industry's average profit ratio for the past 10 years and defense contractors' financial standings. Recent profit ratios are around 3 percent.

However, Director-General Sadao Takahashi of the JDA's Central Procurement Office said, the present standard established in the decade starting in 1955 does not meet reality.

In the review, he explained, the JDA has no intention of raising the profit ratio. The real purpose is to correct unfair sections, if any, of the current system, he added.

The JDA has commissioned a private accounting group to review the current profit ratio system and study new methods. The group's report is expected by next spring. The agency has also set up a task force to deal with the review.

Based on the review, the JDA will make a decision on the method and time for effectuating it.

A counterproposal on the standard is also expected from the defense industry, which has been dissatisfied with the existing method.

CSO: 4120

LICENSING CONTRACTS ON P-3C EQUIPMENT

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 6-7

[Text] Japan Radio Co. and Kokusai Electric Co. have concluded contracts with American avionics manufacturers for license production of avionics systems for P-3C antisubmarine patrol aircraft of the Maritime Self-Defense Force (MSDF).

Japan Radio has been appointed as a manufacturer of Edmac Associates Inc.'s R-1651 sonobuoy indicators for 10 P-3Cs covered by the second MSDF contract to be concluded under the FY 1980 budget. It has already signed a licensing contract with Edmac and is seeking governmental approval, which is expected by the end of October. As the US government's go-ahead is expected later, Japan Radio is likely to start preparations for license production next spring, including dispatch of engineering teams to Edmac. Its license production will also cover such sonobuoy indicators for P-3Cs after the second contract.

Another avionics system for Japan Radio's license production is the Edmac ARR-72 sonobuoy receiver. The company is designed to manufacture such sonobuoy receivers for all of MSDF P-3Cs, including eight aircraft covered by the first MSDF P-3C contract of FY 1978.

Kokusai Electric has been assigned to manufacture RCA ARC-161 high-frequency (HF) radio systems and Sperry Marine Systems' CU-2070/ARC HF antenna matching boxes for P-3Cs covered by the second and subsequent P-3C contracts. It has also been selected to produce HF privacy telephone sets for all of the P-3Cs, including eight aircraft in the first P-3C contract.

Kokusai Electric's licensing contract with RCA has already been approved by the government. Its contract with Sperry will be signed by early November with government approval expected late in the month.

Its preparations for license production of the radio systems and antenna matching boxes will begin next spring with engineering teams sent to respective US companies.

CSO: 4120

MILITARY

PROCUREMENT OF SIMULATORS FOR AA WEAPONS SET

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 7-8

[Text]

The Ground Self-Defense Force (GSDF) has requested ¥450 million for procurement of three simulators for testing antiaircraft (AA) weapons systems in FY 1981 following the first one in FY 1980, according to informed sources. It intends to deploy a total of five simulators at all five GSDF regional commands.

The GSDF AA systems comprise original and improved Hawk surface-to-air missiles (SAM), Tan-SAM short-range missiles, Stinger portable SAMs, L-90 35mm machine guns and the 50 caliber (12.7mm) heavy machine guns. The Tan-SAM has been domestically developed for procurement from FY 1981 along with the Stinger.

The GSDF has already procured simulators for AA systems linked with fire-control system (FCS) radars, including the Hawk system and L-90 machine guns. Simulators for FCS-controled Tan-SAMs are to be procured in FY 1981 along with the missiles.

These simulators cannot cover weapons for testing and actual shooting practice for such weapons is difficult in Japan. These conditions have prompted the GSDF to facilitate procurement of the new simulators.

Informed sources speculated the new simulators can cover all of GSDF AA weapons-- Tan-SAMs and L-90 guns without FCS control, caliber 50 guns and Stinger SAMs.

CSO: 4120

MPC TO NEGOTIATE LICENSING CONTRACT WITH CMC ON APN-227

Tokyo JPE AVIATION REPORT-WEEKLY in English 12 Nov 80 p 4

[Text]

Mitsubishi Precision Co. (MPC) will start negotiations soon with Canadian Marconi Co. (CMC) on a contract for license production of CMC's APN-227 Doppler radar, which the Maritime Self-Defense Force (MSDF) has decided to adopt for the P-3C antisubmarine patrol aircraft. MPC has been selected by the JDA to manufacture Doppler radar navigation systems for 10 P-3Cs covered by the second P-3C contract due out in FY 1980 and subsequent aircraft.

MPC was to contact CMC representatives visiting Japan for a Nov. 4-7 Canadian aerospace fair at the Canadian Trade Center in Ikebukuro, Tokyo and hopes to sign the licensing contract by the end of this year. Preparation for license production of APN-227 systems will start next spring after government approval.

The MSDF plans to install APN-227 Doppler radars in all of the 45 P-3Cs to be procured, although P-3Cs have so far been equipped with Singer Co.'s APN-187 Doppler radars. The US Navy has already decided to adopt the CMC APN-227 as the Canadian Defense Forces have mounted the CMC radars on their CP-140 antisubmarine patrol aircraft.

CSO: 4120

MILITARY

BRIEFS

CALL FOR STRENGTHENING FORCES--Tokyo Nov 7 KYODO--A former top defense agency official Friday called for launching reconnaissance satellites and boosting self-defense force reserves against a "possible attack by the Soviet Union." Shigeto Nagano, former chief of staff of the ground self-defense force, also told a professional seminar at the defense agency that Japan should be prepared for biochemical warfare and accumulate enough weapons beforehand against a Soviet preemptive attack which he said is "very probable." The present 40,000 SDF reserves should be more than doubled, Nagano said at the seventh top defense seminar held under the auspices of the agency. Nagano also said SDF should possess enough military capability to halt and beat back aggressors "out of the country and far out in the sea." "If permissible," Nagano said, "Japan should have forces to hit enemies' bases." The remark presented a sharp contrast to the view of the government which has ruled out an attack on enemies' bases even if it is necessary for Japan's defense. Nagano also called for command over "substantial areas in the Northwestern Pacific" so that Japan can close vital straits of Soya, Nemuro and Tsushima to contain the Soviet Pacific fleet based at Vladivostok. Nagano was top GSDF official for two years before he resigned earlier this year because of a scandal involving a retired GSDF general who spied for the Soviet Union. [Text] [OW070931 Tokyo KYODO in English 0920 GMT 7 Nov 80]

OKURA AWARDED CONTRACT--The JDA has awarded Okura & Co., a sales agent for Fairchild, a ¥165.1 million contract for 17 Fairchild AN/AXQ-16 (V) cockpit television sensors (CTVS) to be mounted on the first 15 F-15J fighters for the Air Self-Defense Force (ASDF), on which a contract was concluded with MHI in FY 1978 for license production. Delivery is set for January 1982. Two of the 17 CTVS units are not for actual mounting. Another CTVS contract for 30 of 34 F-15Js to be ordered in the current fiscal year will be concluded with Okura by March 1981 at the latest. The other four F-15Js will be procured under a foreign military sales (FMS) contract with the United States. The ASDF has decided to adopt the Fairchild AN/AXQ-16 (V) CTVS because the US Air Force is to install the Fairchild systems in its F-15s. Besides the first CTVS contract, Okura has been awarded a ¥31.65 million contract for equipment for testing. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 p 7]

LONG-RANGE RECONNAISSANCE CAMERA--The Central Procurement Office of the Japanese Defense Agency (JDA) has concluded a contract with Nissho Iwai Aerospace to import a 1,600mm camera for Air Self-Defense Force's (ASDF) reconnaissance unit from CAI, a division of Bourns, Inc. Delivery is planned for March 1982. The long-range camera will be mounted on a RF-4E Phantom for surveillance of the four Soviet-held islands east of Hokkaido--Kunashiri, Etorofu, Habomai and Shikotan. It can detect 80-centimeter-size objects at a range of 30 to 60 miles and identify types of aircraft sitting on the ground. No such camera is available in Japan. The ASDF is expected to procure four to five units of the cameras after evaluation of the first. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 12 Nov 80 pp 3-4]

CSO: 4120

RJ500 ENGINE TO BE AIMED AT BOEING 737-300

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 2-3

[Text]

Rolls-Royce and Japanese Aero Engines Limited, a joint venture between Rolls-Royce Limited and three Japanese heavy industrial firms, IHI, KHI and MHI, established for development of the RJ500 turbofan engine, held its third board meeting at IHI's head office in Tokyo October 27.

It was decided at the meeting that Rolls-Royce and the Japanese partner companies will step up their efforts to sell the engine initially for the Boeing 737-300 aircraft which the American company is expected to begin developing very soon, and that the engine development program be speeded up in order to meet Boeing's schedule. The board of directors also decided on the shares of the joint engine venture which was capitalized at £2,000. Rolls-Royce will hold 1,000 shares, IHI 598, KHI 252 and MHI 150.

Approximately 30 British and Japanese engineers assigned from the four participating companies are engaged in basic designing of the RJ500 engine at Portland Square, Bristol, England. The work is reportedly progressing on schedule and fabrication of prototype engines is expected to start early next year, Japanese industry sources say.

Depending on progress in the 737-300 program, the RJ500 engine program may be speeded up for one to two years, a spokesman for the Japanese firms said. In addition to Boeing, Fokker Aircraft, Airbus Industrie and McDonnell Douglas are reportedly interested in the Anglo-Japanese engine for their new medium class aircraft projects. The engine will also be designed to power the Y-XX aircraft which Japan plans to develop in collaboration with a foreign manufacturer(s) in the future.

CSO: 4120

ECONOMIC

REPLY TO FOKKER'S F-29 PROPOSAL EXPECTED BY DECEMBER

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 p 3

[Text]

The Japanese aircraft industry is believed to have told Boeing Commercial Airplane Co. that it will prepare a response to Fokker Aircraft Co.'s proposal for Japan-Boeing-Fokker joint development of the F-29 medium-size commercial aircraft by early December, according to industry sources.

During talks with Boeing in Seattle in the middle of October, Japanese representatives explained they will base the response on consideration of Airbus Industrie's SA proposal as well as the Fokker program and financial and personnel aspects of Japan's Y-XX medium airliner development scheme. The Japanese industry is expected to unite the Y-XX scheme with one of the foreign proposals.

The representatives returned Oct. 22 after the talks. They included Vice Chairmen K. Uchino and E. Yamaguchi of Civil Transport Development Corp. (CTDC), Managing Directors I. Shibuya of Fuji Heavy Industries (FHI) and T. Yamada of Kawasaki Heavy Industries (KHI), and General Manager Y. Sasaki of Mitsubishi Heavy Industries' (MHI) Nagoya Aircraft Works.

Boeing told them that its task force is now positively considering the Fokker proposal to draft a counterproposal in the middle of November, according to the sources.

The Japanese and Boeing representatives also discussed a plan to increase the monthly rate of Boeing 767 production to 8.5 aircraft in the latter half of 1983 and to 10 aircraft by the end of that year. The Boeing 767 is boing manufactured jointly by Japan, Italy and Boeing.

At the talks, the Japanese said they will make a definite response to the plan by the middle of November after considering aircraft production equipment and personnel.

CSO: 4120

TOKYO SCREW TO EXPAND PRODUCTION OF AIRCRAFT SCREWS

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 p 4

[Text]

Tokyo Screw Co. plans to increase its capacity for production of screws for aircraft as domestic and foreign demand is expected to rise from 1981.

Sales of screws for aircraft in the business year ending in September 1980 totaled about ¥3,200 million, accounting for about 25 percent of its overall sales amounting to about ¥12,000 million. In the next business year, the firm intends to increase these sales by 30 percent or ¥1,000 million to ¥4,200 million with their proportion in overall sales rising to 30 percent. To do that, it plans to invest ¥1,200 to ¥1,300 million in equipment for aircraft screw production in the next two years.

Increased domestic demand for the company's aircraft screws will come from production of F-15 fighters for the JDA and Boeing 767s starting next year.

Foreign orders are also up thanks to its past export promotion efforts, including sample exports to AMD-BA of France and submission of estimates to Lockheed Corp. Final negotiations with Lockheed are planned for the immediate future on aircraft screw exports which are expected to contribute to increasing its sales from the latter half of 1981.

The firm has so far continued to increase research and development funds for the aircraft screw division, although 60 percent of its screw output is for the auto industry. Investment will be further facilitated in equipment mainly for metal treatment and processing in the division. At the same time, the division will be rationalized to cope with both of a continued increase and possible fluctuations in demand.

CSO: 4120

HOSOI WORKS TO PROMOTE SALES OF CARBIDE TOOLS

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 4-5

[Text]

Hosoi Works Co. of Osaka has started research into milling special alloys for aircraft with its carbide ball end mill jointly with Assistant Professor S. Horiuchi of Toyohashi Technology and Science College to prepare for increased sales of the mills to the American aircraft industry.

Although it seems difficult to obtain such special metals for the research, the company intends to seek cooperation from the jet engine division of General Electric (GE), with which it maintains close relations.

The mill, called "the Dijet-Hosoi Mill," has been developed by Hosoi for joint production with Dijet Industry of Japan. Hosoi has already concluded contracts with GE and Sandvik for export of the carbide machine tools.

The research has been prompted by various inquiries about the Dijet-Hosoi mill made at an international machine tool show in the United States in September.

Although the carbide mill can machine heat-treated SKD, SKT, SKB, SUS and FC materials more than 10 times faster than high-speed steel tools, data about its processing of titanium alloy and other super alloys have yet to be prepared. Research is necessary before full-scale sales promotion in the United States. Hosoi is hopeful of increased demand from the American aircraft industry after the data are prepared.

Most American aircraft manufacturers are using high-speed steel tools because low-cost high-speed steel is advantageous in heavy machining which wear out a tool every few minutes. However, interest is increasing in carbide tools with upgraded wear resistance, which can also machine materials at high speed with high accuracy. Especially, there is potential demand for carbide tools for milling titanium alloy.

CSO: 4120

ECONOMIC

TAX COUNCIL SUGGESTS NEW TAXES

OW071159 Tokyo KYODO in English 1137 GMT 7 Nov 80

[Text] Tokyo Nov 7 KYODO--The tax system council Friday suggested to Prime Minister Zenko Suzuki that a new excise tax should be levied if sufficient tax revenues were to be secured to rehabilitate Japan's debt-ridden public finances.

The council made the suggestion in a three-year (fiscal 1981-83) tax reform recommendation submitted to the prime minister.

The advisory body claimed in the recommendation that a new excise tax which would replace the general consumption tax plan, killed shortly before last year's general election, should be instituted.

The council, however, called on the government to make every possible effort to minimize outlays and maximize revenues under the existing tax system before it decides to levy the projected new excise tax.

The recommendation also calls for consideration of increases in the individual income and local inhabitant taxes if other measures to increase tax revenues are found to be inadequate.

The council stated clearly in the recommendation that some increase in the corporation income tax was unavoidable.

It also called for a raise in the specially reduced income tax rates on medium-size and small corporations and public utility corporations, and a higher tax on business revenues used as entertainment expenses.

Increased stamp and securities trading taxes were also recommended.

Government sources said the finance ministry would propose "selective increases" in existing taxes, centered on the corporation income tax, for fiscal 1981 on the basis of the recommendation.

The sources added that the ministry would make overy effort to introduce a new excise tax from fiscal 1982.

The recommendation makes no detailed reference to the proposed nex excise tax. However, council members feel that the proposed tax should be patterned after the European common market's value added tax (VAT).

CSO: 4120

LDP BACKS UP AIRCRAFT INDUSTRY PROJECTS

Tokyo JPE AVIATION REPORT-WEEKLY in English 12 Nov 80 pp 2-3

[Text]

A subcommittee of the ruling Liberal-Democratic Party's Policy Affairs Research Council has adopted a resolution urging the government to subsidize the aircraft industry's Y-XX medium transport development program, RJ500 aero engine project, Boeing 767 program and aircraft purchases in FY 1981.

For the next fiscal year, the Ministry of International Trade and Industry (MITI) has requested ¥422 million for the Y-XX program, ¥5,159 million (¥1,787 million in FY 1980) for the RJ500 program, ¥2,778 million (¥6,943 million) for the Boeing 767 program and ¥3,300 million for a new system to help finance aircraft purchases. MITI has also sought ¥3,888 million for the RJ500 project and ¥1,225 million for the Boeing 767 project in follow-on disbursement.

The LDP resolution amounts to full backing for the budgetary request for FY 1981. The resolution was adopted at a meeting last week of the Subcommittee on the Aircraft Industry of the LDP council's Commerce and Industry Committee. The subcommittee was set up last April for research into Japan's aircraft and defense industry policy.

LDP members present at the meeting included Acting Chairman Kozo Watanabe, Hiroshi Kumagai, Kabun Muto, Gentaro Nakahara and Shinichiro Shimojo. They heard explanations on the budgetary request from MITI officials such as Director-General S. Kurihara of the Machinery and Information Industries Bureau and Director Y. Sakamoto of the bureau's Aircraft and Ordnance Division. Industrial circles sent representatives to the meeting. Among them were Eiichi Ohara, President of the Society of Japanese Aerospace Companies (SJAC) and Chairman of Fuji Heavy Industries, Kozo Hirata, SJAC Managing Director, Gakuji Moriya, Chairman of Mitsubishi

Heavy Industries, Kiyoshi Yotsumoto, Chairman of Kawasaki Heavy Industries, and Taiji Ubukata, President of Ishikawajima-Harima Heavy Industries.

Ohara explained the budgetary request regarding the aircraft industry and sought LDP support. Moriya briefed the LDP members on the Y-XX program, Ubukata the RJ500 program and Yotsumoto the Boeing 767 program.

On the Y-XX project, Moriya said international collaboration will be necessary for smooth penetration into the world market. The industry is now studying Y-XX proposals from European and American manufacturers, he added.

Terming the Y-XX program the last aircraft development project for the 20th century, Moriya stressed the program should be launched next year. The Japanese industry would have to carry out preparatory design of the Y-XX on its own to secure independence in the international program, he said.

The LDP subcommittee members asked questions on the Y-XX and other aircraft programs and then came up with their resolution.

CSO: 4120

RICE CROP EXPECTED TO BE WELL BELOW PROJECTIONS, DEMAND

OW120048 Tokyo KYODO in English 0007 GMT 12 Nov 80

[Text] Tokyo Nov 12 KYODO--Rice, the staple food of the Japanese people, will be of poorer quality and not as tasty as in past years in the 1981 rice year beginning November.

This is because the Ministry of Agriculture, Forestry and Fisheries has decided to sell rice harvested this autumn by mixing it with surplus rice of the 1978 crop.

It plans to start supplying some 200,000 tons of the surplus rice, now kept in warehouses at low temperature, from early next month.

The ministry hopes to sell the mixed rice at a price some 5 percent lower than the standard price of yen 3,260 per 10 kilograms.

The step is being taken because this autumn's rice crop is expected to amount to only 9,820,000 tons, some 1,300,000 tons less than projected, due to the abnormal cool weather during the summer months.

Ministry officials said this autumn's rice crop alone will not be able to meet the expected demand of 10,750,000 tons in the new rice year.

This will be the first time in eight years that surplus rice is distributed to cope with poor rice harvest.

The mixing of old rice with newly-harvested rice is expected to further promote the tendency among the people to shun rice in favor of bread and other staple food.

The ministry officials explained that the surplus rice to be mixed with the new rice crop is of comparatively good quality since they are being stored at low temperature.

Due to the decline in rice consumption, the government now has a stockpile of 6,500,000 tons of unsold rice.

Some of the surplus rice is being exported abroad.

CSO: 4120

ECONOMIC

CURRENT ACCOUNT RECORDS DEFICIT IN OCTOBER

OW170835 Tokyo KYODO in English 0744 GMT 17 Nov 80

[Text] Tokyo Nov 17 KYODO--Due to a smaller trade surplus, Japan's current account returned to the red in October, the finance ministry announced Monday.

Preliminary figures showed the October current account suffered a dollar 70 million deficit. The account in September chalked up the first surplus in 15 months, of dollar 953 million.

Exports in October were 32 percent above the year before at dollar 11,530 million, while imports rose 18 percent to dollar 10,750 million.

This left a dollar 780 million trade surplus, compared to dollar 1,949 million in September.

The trade figures were calculated by an International Monetary Fund (IMF) method, with both exports and imports reckoned on a free on board (FOB) basis.

Ministry officials blamed the decreased trade surplus on surging oil imports for winter.

On a customs clearance basis, the trade balance was in the red by dollar 294 million in October. In the previous month, Japan posted surplus of dollar 938 million. In this case, exports were calculated on a FOB basis and imports on a cost, insurance and freight (CIF) basis.

Shortfalls in invisible trade and transfers narrowed a bit to dollar 850 million from dollar 996 million in September.

Reflecting a sluggish inflow of foreign investments, the October long-term capital balance showed a deficit (first in six months) of dollar 910 million, compared with a dollar 763 million surplus in September.

Domestic capital recorded an outflow of dollar 1,120 million, while the foreign capital inflow came to dollar 210 million, compared to figures of dollar 1.5 to 2 billion in the preceding five months.

As a result, the overall balance of payments (the current account and long- and short-term capital accounts) suffered a shortfall of dollar 1,080 million.

This compared with a dollar 946 million surplus in September and a dollar 3,471 million shortfall a year ago.

The basic balance of payments (the current account plus the long-term capital account) recorded a dollar 980 million deficit, from a dollar 1,716 million surplus the previous month.

On a seasonally-adjusted basis, the October current account posted a dollar 85 million deficit against a dollar 435 surplus the previous month. The overall balance was dollar 1,095 million in the red, compared with a dollar 428 million surplus a month ago.

CSO: 4120

ECONOMIC

BRIEFS

SAUDI BOND PURCHASE--Tokyo, 1 Nov KYODO--Saudi Arabia has offered to buy a large amount of privately placed yen-denominated government-guaranteed bonds in a bid to increase its investments in Japan, the NIHON KEIZAI SHIMBUN reported Saturday. The Japanese Government has begun making a study to meet the offer made by the Saudi Arabian Monetary Agency (SAMA), the nation's central bank, according to the economic vernacular. SAMA said it wanted to purchase not only Japanese national bonds but yen-denominated government-guaranteed bonds issued by public corporations on a private placement basis, saying that the amount of publicly placed bonds available for its purchase was limited, the daily quoted official sources as saying. The amount of each private placement will probabaly be yen 10 billion to begin with. If everything goes well, the SAMA's annual investment in such bonds will total more than yen 100 billion, NIHON KEIZAI said. The paper said that the issuer of bonds will be picked from among public corporations, such as the Industrial Development Bank of Japan, Nippon Telegraph and Telephone Public Corporation (NTT), Japan Air Lines (JAL) and Electric Power Development Co. 'Abd al-'Aziz al-Qurayshi, governor of the SAMA, indicated his country is ready to increase oil money investments in Japan during his talks in Tokyo with Finance Minister Michio Watanabe last Tuesday. [OW020417 Tokyo KYODO in English 0132 GMT 1 Nov 80]

LONG-TERM GRAIN PACT--Tokyo Nov 9 KYODO--Japan will shortly propose restoration of a long-term grain import agreement with the United States amid worldwide crop failures, the NIHON KEIZAI SHIMBUN reported Sunday. The leading economic daily quoted sources as saying the government finds it necessary to sound out the United States at an early date about the proposed revival. The sources said the proposal would come up for discussion at next U.S.-Japan regular consultations on farm products in Washington early next month. In 1975, Japan concluded an agreement with the United States assuring the supply of at least three million tons of wheat, at least eight million tons of feedstuffs and at least three million tons of soybean a year. The agreement expired in 1978, and was not re-negotiated. [Text] [OW090703 Tokyo KYODO in English 0658 GMT 9 Nov 80]

PLANT PLANS DEADLOCKED--Osaka Nov 17 KYODO--Sanyo Electric Co. said Monday its plan to build a refrigerator-compressor plant in China in a joint venture with Shanghai Municipal authorities has become deadlocked. The company said this is because the Shanghai Municipal government did not earmark any appropriations for promotion of the project in its 1981 budget. Sanyo added it hopes to reopen the project sometime in the future, though it is not known when it will be able to do so. The company and the Shanghai authorities were origianlly scheduled to sign a formal contract on the project toward the end of this year and put the plant into operation late next year. A basic agreement reached earlier between Sanyo and the Shanghai Government called for establishment of a joint venture in a Shanghai industrial complex to produce 500,000 refrigerator-compressors annually. [Text] [OW170426 Tokyo KYODO in English 0245 GMT 17 Nov 80]

CSO: 4120

FY '81 MILITARY R&D BUDGET REQUEST BREAKDOWN

Tokyo JPE AVIATION REPORT-WEEKLY in English 12 Nov 80 pp 4-9

[Text]

The Defense Agency is requesting more than ¥28 billion in the FY 1981 defense budget draft for research and development of military equipment, in addition to ¥23 billion to be appropriated on a follow-on disbursement basis. The amount is 23.1 percent above that of military R&D spending for the current fiscal year. A breakdown of the military R&D budget request for FY '81 follows:

Unit = ¥1 million

ITEM	AMOUNT
* Aircraft and aero engine	
Basic designing of the MT-X new intermediate trainer	2,390
Control configured vehicle (CCV) -- part 2	2,510
Small turbofan engine -- part 2	2,550
Remotely piloted vehicle -- part 1	60
Aircraft systems simulators -- part 1	100
Basic research on composite materials structure	50
Basic research on high performance engine control systems	30
sub total:	7,690

* Guided weapons

Air-to-air combat missile -- part 2	2,070
Chu (medium size) antitank missile -- part 4	90
Surface-to-ship missile -- part 4	440
Portable surface-to-air missile (SAM) -- part 2	1,880
HTPB propellant -- part 3	110
Testing equipment for image homing systems -- part 2	210
Precision guided simulators -- part 2	930
Auxiliary equipment for physical simulation systems	220
sub total:	5,950

* Electronic equipment

Electronic exchange equipment for GSDF regional commands	490
New field radio	540
New antimortar radar	900
New field surveillance radar	270
Electronic countermeasure equipment for surface ships	1,360
XJ/ALR-1 electronic countermeasure (ECM) equipment	420
XJ/ALQ-5 ECM	1,240
XJ/ALQ-8 ECM	470
Fabrication of antenna for future fire control systems	170
Basic designing of installing equipment for XJ/ALQ-8 ECM	150
sub total:	6,010

* Weapons and fighting vehicles	
Type 1 field mine	210
New fuse	320
Fabrication of ammunition components	60
Studies on structural elements for new tank	100
Mechanized Infantry Combat Vehicle (MICV)	1,120
Caliber 5.56mm rifle	18
155mm howitzer ammunition locking system	110
General systems studies on new tank	100
sub total:	2,038
* Naval equipment	
GRX-2 highspeed homing torpedo	4,540
New diesel engine for minesweepers	590
Inertial navigation systems for submarines	330
Reinforced plastic boat for testing	370
High tension steel for future submarines	50
Studies on noise reduction of ship components	60
Studies on noise reduction of screw propellers	40
Magnetic detection equipment for mines placed in dirty water	140
GRX-3 antisubmarine short torpedo	620
sub total:	6,740
* Miscellaneous R&D items	30
Total:	28,458

General outlines of major R&D items follow:

AIRCRAFT AND ENGINE

MT-X: It will be designed as a replacement for both the Lockheed T-33 and the Fuji T-1A/B intermediate trainers now in service with the ASDF. Six prototype aircraft, four for flight and two for fatigue testing, will be fabricated during the period, FY '81 - '87, at an approximate cost of ¥40,000 million.

CCV: Following fabrication of electric flight control systems, air-combat flaps and canard wings in FY '79 - '80, the TR&DI is requesting funds for fabrication of other structural components and modification of a T-2 trainer. Flight testing of the CCV is scheduled to start in FY '82 - '83.

Small turbofan: The TR&DI has so far fabricated and tested XF3-1 and XF3-20 engines. Five development engines will be fabricated in FY '80 - '82. Funds are being requested in the FY '81 budget draft for fabrication of an additional five. The TR&DI will use these engines for high altitude, safety, reliability and endurance tests in order to discover adaptability of the XF-3 series engines for the MT-X.

GUIDED WEAPONS

Air-to-air combat missile: An infrared-ray homing missile, to be used for close range aerial dog-fighting. The TR&DI plans to fabricate the airframe, rocket motor and servomechanism of the missile in FY '81. It is expected to be used with the F-15 in the future.

Portable SAM: A shoulder-launched portable missile, it will be equipped with an image homing system. Funds are being requested for fabrication of a prototype airframe and guidance system. It is targeted as a replacement for the Stinger and will be used by all three services for short range air defense missions if development proves successful.

ELECTRONIC EQUIPMENT

New field radio: To be designed to modernize field communications systems of GSDF frontline units as a replacement of the present Model 69 radio. Development of a digital type radio will be completed in FY '82.

ECM for surface ships: Following development of detection and identification systems in FY '80, the TR&DI will concentrate efforts on fabrication of jamming systems in FY '81. When completed, the equipment will be used mainly by MSDF destroyers.

Future FCS: The TR&DI will begin fabrication of an active phased-array antenna in FY '81 as part of its efforts to design and develop new fire control systems for future high performance combat aircraft.

FIGHTING VEHICLES

New tank: Following studies on the smooth bore gun, ammunition, armor plating, powerplant, fire control systems, hydraulic motor, chassis and other components in previous years, the TR&DI will proceed with fabrication of armor structure consisting of steel and ceramic and overall systems studies in FY '81. The first prototype vehicle will be fabricated in FY '82 and the second in FY '84. Production of the new tank is scheduled to begin in FY '88.

MICV: To be used by infantry for close support operations with main battle tanks. Funds are requested for fabrication of the chassis and the body in FY '81. It will be equipped with a 35mm machine gun and a Model 79 SSM, and will be able to carry ten infantry men. The MICV will initially be assigned to 7th Division units.

NAVAL WEAPONS

GRX-3: It will be designed to attack high performance submarines travelling very deep. It will be able to be launched from aircraft or surface ships. The TR&DI will begin fabrication of the torpedo frame in FY '81, based on element studies conducted in previous years.

CSO: 4120

MHI COMPLETES BASIC CCV DESIGN

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 8-9

[Text] MHI has completed basic design of a control-configured vehicle (CCV) aircraft for the JDA, paving the way for manufacture of the aircraft in the future.

The basic design has been approved by the JDA, making it promising for Japan to catch up with advanced CCV technology in the United States and Europe. MHI has already started test fabrication of some CCV components under the basic design.

According to the JDA and MHI, the basic design had standard marks for five of the six CCV evaluation items, including the fly-by-wire control and turning performance. The remaining item of combat performance has not been subject to the basic design.

The JDA appropriated about ¥150 million from the FY 1978 budget for basic research into the CCV with MHI appointed prime contractor. MHI organized a 40-man research team jointly with other aircraft manufacturers such as KHI and FHI for the just-completed systems research and basic CCV design.

The JDA has also earmarked about ¥3,400 million in the FY 1979-81 budgets for specific design and fabrication of CCV components, which have been launched by MHI. Until FY 1983, an additional ¥2,500 million will be spent on manufacture of an experimental CCV aircraft for flight tests.

The JDA and MHI expect that they will be able to acquire very advanced aircraft technology if the CCV aircraft is completed as planned.

The CCV technology is certain to be used for Japan's future domestic development and production of fighters.

CSO: 4120

TR&DI PLANS TO DEVELOP TASS SENSOR FROM FY 1982

Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 p 9

[Text]

The JDA's Technical R&D Institute (TR&DI) intends to start technical development of a towed audio surveillance system (TASS) for MSDF antisubmarine operations in FY 1982 or 1983, according to informed sources. The MSDF is expected to draft a written request for the technical development by March 1981.

The TR&DI has been proceeding with research into the TASS sensor since FY 1977. It has already fabricated such parts as a towing cable, a towed box containing the sensor and a recovery system. Under the FY 1980 budget, about ¥200 million is appropriated for supplementary research, which will pave the way for technical development.

Although the TR&DI/MSDF place great expectations on the domestically developed TASS sensor, there will be several more years before development is completed. Therefore, the MSDF plans to purchase SQR-18 TASS sensors from the United States for evaluation on VDS-mounted MSDF ships. It has already requested funds for procuring SQR-18 TASS sensors for three ships in FY 1981.

CSO: 4120

NO SPECIFIC ENGINE PLANNED FOR BASIC MT-X DESIGN

Tokyo JPE AVIATION REPORT-WEEKLY in English 12 Nov 80 pp 9-10

[Text]

The Technical R&D Institute (TR&DI) of the JDA is expected to promote basic design of the MT-X next-generation intermediate jet trainer without selecting any specific engine in FY 1981.

Although the TR&DI wants to adopt the XF-3 small turbofan engine now under local development for the MT-X, the basic design will emerge before completion of the XF-3 engine program. Pre-flight rating tests using 10 prototype XF-3 engines will be finished by the end of FY 1982.

The TR&DI will study selection of an MT-X engine while going ahead with work on the basic MT-X design.

Other candidates for the MT-X engine include the Larzac of France and the Garrett AiResearch TFE-1042 of the United States. Their thrust ranges from 1.6 to 1.8 tons, while an experimental XF-3 engine has produced a thrust of 1.66 tons.

The TR&DI has requested in FY 1981 ¥2,400 million, including ¥1,903 million for follow-on disbursement, for the basic MT-X design. If the request is approved, it will accept and study airframe manufacturers' plans before selection of a contractor.

CSO: 4120

JAPAN TO STUDY ERS-1 DATA ANALYSIS TECHNIQUES

Tokyo JPE AVIATION REPORT-WEEKLY in English 12 Nov 80 p 10

[Text]

The Metal Mining Agency of Japan will set up a task force Nov. 13 to study techniques for analyzing data from the nation's first earth resources satellite (ERS-1), which MITI and the Science & Technology Agency plan to launch in FY 1986.

The 12-man task force, to be led by Prof. Yoshinori Ishii of Tokyo University, will prepare reports by the end of FY 1980 or March 1981 on effective utilization of ERS-1 data for natural resources exploration and a long-term comprehensive program for research and development of ERS-1 data application techniques until FY 1986. The reports have been commissioned by MITI's Agency of Industrial Science and Technology.

In the study, the committee is expected to acquire multispectral data for natural resources-rich areas by using a multispectral scanner mounted on aircraft.

The software study will precede research and development of the satellite by MITI and the Science & Technology Agency starting in FY 1981 for a six-year run. For FY 1981, they have requested ¥3,970 million for the ERS-1 hardware program.

At present, the Metal Mining Agency analyzes geological photo data sent from satellites of the US National Aeronautics and Space Administration (NASA).

CSO: 4120

BRIEFS

TECHNOLOGICAL AGREEMENT--Tokyo Nov 18 KYODO--Mitsubishi Heavy Industries Ltd. said Tuesday it has signed a five-year technological cooperation agreement with China for manufacture of small-size forklifts. The contract concluded with a forklift producing factory in Beijing, calls for Mitsubishi to extend guidance on production process and quality control as well as cooperate in improvement of the plant and training Chinese engineers in Japan. Mitsubishi officials did not disclose the value of the contract and the payment method. This is the first time that a Japanese forklift maker is extending technological cooperation to China. [Text] [OW180029 Tokyo KYODO in English 0018 GMT 18 Nov 80]

ANTIMORTAR RADAR PROGRAM--The GSDF/TR&DI are hopeful that the Ministry of Finance will approve their ¥900 million budget request for development of a new antimortar radar in FY 1981, although the request was disapproved in FY 1980, according to informed sources. This is because priority is given to the new antimortar radar in the JDA Director-General's instructions on research and development projects for next fiscal year. The new radar is planned to be procured from the decade starting in 1985. According to the GSDF, the radar will have a phased array antenna for better performance, improved data processing systems for simultaneous detection of multiple mortars, and electronic counter countermeasure (ECCM) capability. Although both self-propelled and towed types have been proposed for the new antimortar radar, only the towed type is in the budget requests for FY 1980 and 1981. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 5 Nov 80 pp 9-10]

CSO: 4120

END

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No. 114

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MILITARY

COMPARISON OF TAN-SAM WITH ROLAND

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 pp 5-6

[Text]

The JDA briefed the Policy Affairs Research Council of the ruling Liberal-Democratic Party last week on the domestically developed short-range surface-to-air missile (Tan-SAM) in comparison with the Euromissile Roland as Democratic Socialist Keigo Ouchi asked questions on the two missiles at the Diet (parliament) in October prior to procurement of the Tan-SAM by the ASDF and GSDF in FY 1981.

According to sources, the Tan-SAM features simultaneous detection and tracking of multiple targets and a longer target range than other infrared short-range missiles. No control is necessary after launching. As to the Roland, all parts of the system can be mounted on a single vehicle for mobility and it features all-weather capability.

The Tan-SAM's radar range is about 50 percent greater than the Roland. Although the Tan-SAM can detect and track multiple tragets simultaneously, the Roland detects multiple targets with a search radar and tracks only one target with a tracking radar.

In launching, two Tan-SAMs can be launched simultaneously. The Roland can not do this. Tan-SAMs can be launched continuously against multiple targets, while the Roland cannot be fired until a preceding one hits a target. There is no launching limitations on the Tan-SAM. Some limits exist on vertical launching of the Roland.

The Tan-SAM's price is set at about ¥2,300 million per launching unit, compared with about ¥3,300 million for the Roland on the basis of the US Defense Department's estimate. The Tan-SAM's life-cycle cost is lower than the Roland.

The JDA's introduction of the Tan-SAM can contribute to increasing employment in related industries. But adoption of the Roland would have no such effect.

Specifications of the Tan-SAM and the Roland follow:

	Tan-SAM	Roland
Length	207 cm	204 cm
Body diameter	16 cm	16 cm
Weight	100 kg	63 kg
Guidance	Airborne lock-on infrared passive homing	Radar command
Range	about 7 km	about 6 km
Maximum speed	about Mach 2.4	about Mach 1.6
Manufacturer	Toshiba	Euromissile (Boeing and Hughes in USA under license)

CSO: 4120

ASDF EXPECTED TO ADOPT IMPROVED V-107 FOR H-X

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 pp 6-7

[Text]

The ASDF is shortly expected to select an improved version of the KHI V-107 helicopter as the H-X rescue helicopter to replace the V-107.

Although some quarters have indicated the possibility of a larger helicopter being adopted as the H-X, the improved V-107 can meet the ASDF's H-X requirements. Furthermore, the improved version can carry out smooth joint operation with existing V-107s and make it easier for the ASDF to shift to a new type.

If the improved V-107 is finally selected, basic design and fabrication of the improved version are expected to come in FY 1982 and 1983 after detailed research in FY 1981.

The ASDF plans to procure 13 rescue helicopters under the FY 1980-84 Medium-Term Defense Program (MTDP). Of them, six are V-107s of the current version for procurement in the first half of the MTDP. They will replace S-62 helicopters. The remaining seven helicopters will be H-X's to replace older V-107s. The ASDF request for the new versions is expected to begin in FY 1983.

CSO: 4120

JDA TO ORDER BASIC DESIGN OF C-1 FOR ECM FROM KHI

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 7

[Text]

The JDA's Central Procurement Office will place a ¥197,858,000 order soon with KHI for a basic design of a modified C-1 transport to be equipped with the XJ/ALQ-5 electronic countermeasure (ECM) system, which has been developed by MELCO for ASDF ECM training against ground control radar and guidance radar for the SAM.

The basic design will be delivered to the JDA in March 1981 for modification of a C-1 from FY 1981 to 1983. The ASDF has already requested funds for the C-1 modification program. In the second half of FY 1981, KHI will prepare necessary machine tools after detailed design, and then, manufacturing of components will start. Full-scale modification will be carried out from the third quarter of FY 1982 to the fourth quarter. The modified C-1 will be delivered to the ASDF in the second half of FY 1983 after flight tests.

The ASDF will continue technical tests for the modified C-1 with the ECM system until FY 1984. Full-scale operation will start in FY 1985.

Fabrication of the XJ/ALQ-5 ECM system is to begin in the current fiscal year. It will be delivered to KHI by the third quarter of FY 1982 to meet the C-1 modification schedule.

CSO: 4120

MILITARY

CIVILIAN SPECIALISTS TO STUDY TAN-SAM ISSUE

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 p 5

[Text]

The Defense Agency last week inaugurated a six-member civilian group for study of the domestically developed short-range surface-to-air missile coded here as the Tan-SAM for the Japanese Self-Defense Forces.

The members of the group include: Makoto Kikuchi, Director of Sony Central Institute; Tadao Kusumi, a military affairs commentator; Toshihiko Kubo, a consultant of Hitachi Ltd.; Hideo Shima, a consultant of the National Space Development Agency of Japan (NASDA); Shun Takeda, Science Research Officer at the National Aerospace Laboratory (NAL) and Yoshimitsu Takeyasu, Chairman of the New Technology Development Agency. The first meeting of the group was held in Tokyo last Wednesday.

Keigo Ouchi, a Democratic Socialist Party (DSP) member of the House of Representatives, raised questions at the House Budget Committee October 11 to the effect that the all-weather Roland missile developed by Euromissile and also being adopted by the US Forces is superior to the infrared-ray homing Japanese Tan-SAM.

The Defense Agency had earlier decided on adoption of the Tan-SAM for both the GSDF and the ASDF for field units and airbase support squadrons respectively, and requested funds for a total of ten units in the FY 1981 defense budget draft.

At the top-level meeting between Prime Minister Zenk Suzuki and DSP Chairman Ryosaku Sasaki on Oct. 24, Suzuki promised that the government would study the Tan-SAM issue before the budget draft is presented to the Diet toward the end of the year. The civilian group was set up as a result of discussions held between Kiichi Miyazawa, Chief Cabinet Secretary, and Joji Omura, State Minister for Defense, early last week.

Omura, however, told reporters that it was unanimously agreed by defense leaders the Tan-SAM would be most suitable for the Japanese services. He added that the civilian group was inaugurated so that the agency would have an opportunity to explain the missile and to hear opinions from civil circles in order to "wipe out misgivings about the Tan-SAM among the general public."

CSO: 4120

MILITARY

NEW TERMINAL TRANSPORT HELICOPTER SELECTION IN FY81

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 p 6

[Text]

The Air Self-Defense Force (ASDF) plans to select a new heavy-lift terminal transport helicopter in FY 1981 for procurement from FY 1982, following introduction of Lockheed C-130 transports for long-range transport.

The ASDF hopes to procure about 10 units of the new helicopters in the first stage to restructure transport squadrons along with C-130s.

Terminal transport helicopters will be used to carry heavy equipment, which C-1s and C-130s will carry to bases, to remote radar sites and other places without airports. At present, V-107 rescue helicopters are used for these missions.

A helicopter larger than the V-107 is expected to be selected to carry a mobile three dimensional radar weighing five tons, although the ASDF has yet to decide whether to use the new helicopter for this purpose. In preparing for the selection, it will study personnel and equipment needed for transportation in comparison with the V-107.

The 10 first-stage helicopters will be two each for the Northern, Central, Western and Southwestern ASDF areas, and two for reserves. In the second stage, each ASDF regions will receive three. Smaller helicopters will be procured if necessary.

CSO: 4120

MSDF P-3C PRODUCTION PROGRAM-PROGRESS REPORT

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 pp 6-7

[Text]

Under the MSDF's program for domestic production of avionics systems for P-3C antisubmarine warfare (ASW) aircraft, Shimadzu Seisakusho Ltd. has been selected to manufacture the CAE Industries' ASA-64A magnetic detection signal processor and Emerson Electric's RO-32/ASQ magnetic detection recorder for 10 P-3Cs covered by the second MSDF contract in FY 1980 and subsequent P-3Cs.

It has already signed a licensing contract with CAE Industries on the ASA-64A. Government approval is expected by the end of November.

On the RO-32/ASQ, Shimadzu has a contract with Emerson Electric to produce the system for MSDF P-2J ASW aircraft. This contract will be partially revised for the switch to P-3Cs.

Shimadzu will also be in charge of production of three other P-3C avionics items, including the signal converter of EPSCO, for eight aircraft covered by the first P-3C contract in FY 1978. In all it will produce a total of five P-3C avionics items.

Toyo Communication Equipment Co. has been designated to manufacture the APX-76 IFF interrogator and the APX-72 IFF responder of Hazeltine Corp. for the second and subsequent P-3C contracts.

It has concluded negotiations with Hazeltine on an APX-72 responder licensing contract. It will apply for government approval after receiving its contract from the US company. Approval is expected by the end of November.

No new contract on the APX-76 interrogator will be necessary because it has a contract with Hazeltine to produce the intertogator for F-15 fighters.

CSO: 4120

BRIEFS

THREE 155MM HOWITZER CANDIDATES--The GSDF is evaluating three candidates for its new tractor-towed 155mm howitzer to be procured from FY 1984. They are the Britain-West Germany-Italy FH-70, the Swedish FH-77B and the American M-198. Main evaluation subjects include firing, mobility and controllability. The GSDF is also studying a plan of the Technical R&D Institute (TR&DI) to develop a new self-propelled howitzer using the gun barrel of the new towed 155mm howitzer. This development program will start in FY 1982 with standardization planned for FY 1986. The new towed 155mm howitzers are designed to replace the current 105mm and 155mm versions for divisional artillery units. The first seven units will be procured for training in FY 1984. For artillery units of GSDF regional armies, self-propelled 203mm howitzers will be introduced. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 8]

CSO: 4120

KHI TO RENEW V-107 LICENSING CONTRACT WITH BOEING VERTOL

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 pp 3-4

[Text]

Kawasaki Heavy Industries (KHI) and Boeing Vertol Co. have agreed to extend a licensing contract on the V-107 helicopter by another 10 years until Dec. 5, 1990.

The agreement came during negotiations held in Tokyo Oct. 31, although they had been at odds over the price of Boeing Vertol's technical data and services to be given to KHI for the next 10 years. KHI is to apply for government approval of the renewed contract in the middle of November.

The contract on KHI's license production of the V-107 was originally signed in 1960 for a period from Dec. 6, 1960 to Dec. 5, 1970 and renewed in 1970. The renewed contract expires Dec. 5, 1980.

Considering future demand for the V-107 helicopters, KHI decided to renew the licensing contract again. It expects demand from the Japanese Defense Agency (JDA) for new versions of the V-107 because this helicopter is a promising candidate for the H-X rescue helicopter of the Air Self-Defense Force (ASDF). KHI also places expectations on future exports. Furthermore, it will have to continue production of spare parts for V-107s in operation.

Until March 1980, KHI had produced 123 V-107-IIs and V-107-IIAs--58 for the Ground Self-Defense Force (GSDF), nine for the Maritime Self-Defense Force (MSDF), 28 for the ASDF and 28 for export and domestic commercial and other civil customers.

At present, it is manufacturing one unit for the GSDF and two units for the ASDF.

CSO: 4120

CONTRACT WITH EDMAC ON R-1651 APPROVED

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 4

[Text]

The Japanese government has approved Japan Radio Co.'s contract with Edmac Associates Inc. on license production of the R-1651 sonobouy indicator for the MSDF P-3C anti-submarine warfare (ASW) aircraft.

Japan Radio has been selected to produce the sobobouy indicators for 10 P-3Cs covered by the second MSDF contract to be concluded under the FY 1980 budget. Its license production is also to cover P-3Cs after the second contract.

The company also has another contract with Edmac on license production of the ARR-76 sonobuoy receivers for all of the P-3Cs for the MSDF, including eight aircraft covered by the first contract.

Japan Radio will start production of the sonobuoy indicators around March 1980 when the JDA's Central Procurement Office is expected to place an order.

It has enough sonobuoy indicator technology to produce the new indicators with only technical documents provided by Edmac since it has so far manufactured about 130 NR-86 sonobuoy indicators for MSDF P-2Js. It should not have to send engineers to Edmac for training, according to informed sources.

CSO: 4120

MELCO PREPARING FOR AIM-7F AAM PRODUCTION

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 pp 4-5

[Text]

Mitsubishi Electric Corp. (MELCO) is receiving technical documents from Raytheon Co. in preparation for license production of AIM-7F air-to-air missiles (AAM) for ASDF F-15 fighters starting before the end of next March when the JDA will place an order for the missiles. The firm is the prime contractor for AIM-7F production.

It has already selected subcontractors and been preparing equipment for the missile production.

The JDA is to procure 87 AIM-7F missiles under the FY 1980 budget. Of them, 67 will be covered by MELCO's knockdown assembly production. Its full-scale local production will cover the remaining 20 units and about 330 units for procurement in FY 1981, although the local production ratio is targeted at 85 percent even for that stage.

Most of the subcontractors are the same as those for production of AIM-7E AAMs for ASDF F-4EJ fighters. Asahi Chemical Industry Co. is assigned to take charge of boosters. Two new subcontractors are Japan Storage Battery Co. for batteries and New Japan Radio Co. for solid state local oscillators (SSLO). These components are not incorporated into the AIM-7Es. The two firms have so far manufactured the above components for Hawk surface-to-air missiles.

MELCO's AIM-7E production for F-4EJs will finish in FY 1981 with output since FY 1971 reaching about 1,220 units. It is now manufacturing AIM-7Es covered by the final contract which the JDA concluded under the FY 1979 budget.

CSO: 4120

ECONOMIC

INDUSTRY LEADERS IN EUROPE FOR TALKS WITH AIRBUS, FOKKER

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 pp 2-3

[Text]

Iwao Shibuya, Managing Director of Fuji Heavy Industries and Chairman of the Special Committee on the YXX at the Society of Japanese Aerospace Companies (SJAC), Teruaki Yamada, Managing Director of Kawasaki Heavy Industries Ltd., and Kenji Uchino, Vice Chairman of the Civil Transport Development Corp., left for Europe last week for talks with leaders of Airbus Industrie and Fokker Aircraft Co. on possible collaboration in joint development of a new medium size passenger aircraft coded here as the YXX.

Shibuya and his group were scheduled to first visit Toulouse and expected to explain to top management of Airbus Industrie Japan's basic stance toward joint development of the YXX class aircraft. Airbus Industrie has been asking Japan to join their SA1/2 single-aisle aircraft development project as risk-sharing partner. When SJAC leaders including Chairman Eiichi Ohara visited Toulouse last April, the European consortium requested Japan to conduct a joint survey on a non-commitment basis.

After the meeting in Toulouse, they are scheduled to visit Schiphol for talks with F. Swarttouw and other top executives of Fokker Aircraft Co. Swarttouw proposed to the Japanese aerospace industry toward the end of September for its participation in joint development and production of new passenger jet based on their F-29 project with Boeing on an equal basis. Swarttouw was in Seattle, Washington, early last week for discussions with Boeing on the F-29 proposal prior to meeting the Japanese industry leaders in Amsterdam.

*YXX may become larger

Preliminary market studies conducted by individual Japanese aerospace manufacturers indicate that the YXX aircraft which Japan plans to develop in collaboration with a foreign manufacturer(s) now appears to be somewhat larger than what the Japanese originally sought. Indications are that it will have accommodations for 150 - 160 passengers, instead of a 130-seater as conceived earlier, industry sources report.

This is due to a consideration that Boeing would most probably get into the new 130-seat class passenger aircraft market sooner or later. In order to avoid such competition, an increasing number of industry leaders are reportedly in favor of developing an aircraft larger than the 737 and smaller than the 757. The 150 - 160 seater may be the right size of the YXX, they opine.

CSO: 4120

ECONOMIC

SJAC ASKS LDP TO SUPPORT BUDGET FOR STOL PROGRAM

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 pp 3-4

[Text]

Eiichi Ohara, Chairman of the Society of Japanese Aerospace Companies (SJAC), at a recent meeting with the Science and Technology Division of the Liberal-Democratic Party's Policy Affairs Research Council asked the party to support budgetary requests for FY 1981 on research and development of an experimental STOL (short takeoff and landing) aircraft.

Regarding the STOL project, the Science & Technology Agency has requested ¥4,491 million in the next fiscal year and ¥5,829 million in follow-on disbursement. In addition, the Agency of Industrial Science and Technology, Ministry of International Trade and Industry (MITI), has requested ¥2,010 million for development of the FJR fan jet engine to be mounted on the STOL aircraft.

Ohara said the fan jet STOL aircraft project forms an important part of the Japanese aircraft industry's efforts to establish independent technology and increase its technical development capability.

The STOL project was launched in 1977 by the National Aerospace Laboratory (NAL) of the Science & Technology Agency and fabrication of an experimental STOL aircraft started in FY 1979, he added.

Ohara pointed out the experimental aircraft, based on the domestically-developed C-1 transport, is to use the FJR-710 engine being developed by the MITI agency. Thus, he said, the STOL project will use only domestic technology, contributing to development of Japan's aircraft technology.

He also noted recent flight frequencies indicate a possibility that fan jet STOL aircraft will become necessary for efficient utilization of airports and reduction of aircraft noise in future.

To meet future demand, he said, Japan must complete the experimental STOL aircraft by FY 1983 as planned for flight tests to confirm STOL technology.

So far, he noted, the government has approved ¥9,400 million of follow-disbursement and ¥3,600 million in actual appropriations for the STOL project costing a total of about ¥20,000 million.

SJAC, placing great expectations on the project, has provided maximum cooperation, he added.

CSO: 4120

ECONOMIC

BRIEFS

RJ500 FUEL SYSTEM CONTRACTOR SELECTION--Rolls-Royce and Japanese Aero Engines Ltd., a Japanese-British joint venture for development of the RJ500 aero engine, will select contractors for manufacture of the engine's fuel system by the end of November, according to Japanese aircraft industry sources. An order for hydraulic devices, important components of the system, will be awarded to Hamilton-Dowty Fuel Systems, a joint British-American company, the sources said. IHI will also take part in fabrication of the system. For an electronics order, Hamilton Standard of the United States and Dowty and Smiths Industries Ltd. of Britain are competing, the sources said. No manufacturer has been named yet for assembling the two systems, they said. Orders for the fuel system will be handled by IHI on behalf of companies participating in the RJ500 program. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 p 4]

CSO: 4120

EXPERTS DISCUSS RESEARCH, DEVELOPMENT OF ELECTRONIC WEAPONS IN EIGHTIES

Tokyo GUNJI KENKYU in Japanese Oct 80 pp 106-124

[Text] Participants:

Host: from Journal GUNJI KENKYU
Wada: Chief, Internal Equipment Bureaus of Defense Agency
Ohmori: Director, Technical Research and Development Institute of Defense Agency
Abe: Director, First Electronic Department of Mitsubishi Electric Corporation
Tanaka: Executive, Nippon Electric Co
Matsuda: Acting Director, Defense Machinery and Equipment Headquarters of Fujitsu Limited
Yoshida: Assistant Operational Director, Radio Machinery and Equipment Headquarters, and Director, Komukai Plant of Toshiba Corporation
Morimoto: Director, Defense Communications Department of Hitachi Ltd

Present State of Electronic Weapons

Host: Thank you very much for coming to participate in the discussion today. America fought a very long and dragged out war in Vietnam, which was considered utterly wasteful and unrewarding. However, it is noteworthy that new weapons were developed in the course of the war. The electronic laser is said to have had a very revolutionary effect on the latest weapon systems. Today, therefore, I would like to discuss the subjects related to electronic weapons.

First of all, to begin the discussion, I would like to ask Mr Wada, Chief of the Equipment Bureaus of the Defense Agency to discuss the status and future prospects of equipping the armed forces with modern weapons. Subsequently, I would like to ask Mr Ohmori, director of the Technical Research and Development Institute to tell us about your developmental research and its future.

Wada: I have frequently talked about the basic approach to research and development in the Defense Agency at various occasions. Let me reiterate it briefly for you. We consider it most essential to research and develop by our own hands equipment required for defense and considered to be a basic need of our country. Especially, we hope to develop equipment suitable for our land and conditions.

This point is very important for the maintenance and supply of our equipment. Furthermore, research and development of our own is necessary to maintain the capacity for improvement, a kind of growth potential, and we believe that the foundation of our defense power is built by such competence for technical development.

I would like to mention in particular that without ourselves putting our hands into development we cannot even properly evaluate or we will not be in a position to be able to negotiate to the full extent with our counterpart if and when we decide to import most advanced foreign technologies from America or other advanced nations who exert themselves to develop their equipment. These worries may have some grounds. Therefore, the development of equipment is crucial for one thing, in order to develop by ourselves what we really want that matches our land and conditions and insures easy maintenance and smooth supply of equipment, and for another, in order to provide ourselves with the ability to evaluate foreign import technologies with adequate bargaining power.

Successive directors of the Defense Agency have fully recognized the importance of the matters I have just mentioned. Fortunately, the budget for fiscal 1980's research and development is slightly enlarged.

Roughly speaking, the Defense Agency attended to the maintenance of defense capability, to use a common word, by hand to mouth methods. Actually, only a bare minimum treatment has been administered in the past. Consequently, I suspect this to be true that a sufficient budget has not been allocated for a basic program such as research and development.

Frankly, the American budget for research and development is, I believe, 2 trillion 680 billion yen while the Japanese budget for the same is 26 billion 800 million yen. Let me be corrected later if my figures are wrong. The Japanese budget is exactly 1 percent of the American budget. We know this gap is too discouraging and are aware of the need to improve the situation a lot better in this respect.

How to make changes will be controversial, and I would rather not discuss it now but leave it for a later opportunity. Basically, all what I said will summarize the present state of the matter.

Host: I understand there is a Japan-U.S. agreement to move up considerably the estimated medium term operations. In fiscal 1980, will an increase in the equipment expense related budget be seen immediately?

Wada: First, let me correct about the plan to move up the medium term operations. The U.S. asked Japan to give serious consideration to advancing certain programs within the Japanese Government by 1 year. In response to this request, the late prime minister Ohira did not directly touch the subject but implied in effect that Japan would seriously examine what she could do for the enhancement of defense as a member of the Western alliance.

What will then actually happen to the medium term operations will depend on what's what of the fiscal 1981 budget. Just yesterday, the ordinary cabinet council decided to give special treatment status for defense expenses. Under this order, presently the operations estimate is zealously being piled up. How this effort will turn out, first of all, in the fiscal 1981 budget will answer the question, as you see.

Host: Is it for sure that the equipment expenses will be sizably beefed-up?

Wada: That's what I hope. On one hand, however, financial reconstruction is the primary objective of this cabinet. According to what I heard about the results of the meeting between Director General Kimura of the Defense Agency and Minister Watanabe of the Ministry of Finance, as you have probably read in newspapers, they have agreed to give special treatment to defense expenses in the light of the three essential pillars, financial reconstruction, facilitation of the defense capability and coordination of Japan-U.S. relations.

Troubles Associated With Being Responsible For the Development of Electronic Weapons

Host: Mr Ohmori, we assume you are conducting well-organized research and development utilizing an ample budget and human resources of national stature in the Defense Agency. Would you tell us about the present condition and the future prospects?

Ohmori: Incidentally, the services rendered by us, the Technical Research and Development Institute, are not limited to the electronic field. The research and development related budget of the Defense Agency is currently slightly an upward move. This is the result of our last few years' counter efforts to reverse the trend of the slowly impoverished research and development budget up to recent years.

Generally speaking, our research and development is tailored to the needs of the users. When the needs of the users change due to the social and economic conditions of a specific time, this change is also reflected directly upon our work. Well, some may say take things as they come. Technology, however, requires continuity for it to be meaningful. We realized off-and-on research and development effort is not truly fruitful. We must ourselves safeguard the continuity of projects. We have agreed to conduct large scale research which will eventually lead to proposals that bring forth technologies, especially when needs of the users are low. We named it "proposition study."

In short, with the blessing of everyone, we shared our part in an attempt to increase research and development expenses. With this and that, it is gradually climbing up.

Referring to the electronic weapons in particular, the topic of today's discussion, first, I would like to make a minor correction. A little while ago, the host of this discussion introduced me by saying that my professional training was given in the Third Research Laboratory which is known as a "mecca" of electronics. That statement is slightly misleading, and I must say the "mecca" of electronics is the First Research Laboratory as far as the Technical Research and Development Institute of the Defense Agency is concerned.

However, as we will be discussing it sooner or later, our research and development is not singly devoted to electronics. Electronic research and development will be materialized without fail as future weapons or basic softwares demanded by the users. If we look at electronics from this aspect, 60-70 percent of missile expenses are, pushing the argument to its extreme, accounted for by electronic expenses. The expenses of the next generation of aircraft will also include 30 percent electronic related expenses. With these all calculated, the present electronic related expenses is already estimated to run up to 50 percent. The missiles and aircraft handled at the Third Research Laboratory just mentioned are surely key products in terms of the cost, and the electronic works come into our hands through these channels.

Under these systems, it will not be overstating to affirm that the progress of future modern weapons will never be achieved without electronics. Leaving pertinent details for later, first, let me state that when increases in the budget and personnel are requested one-third to one-half of the increase is relegated for electronic areas although it is not that often that we demand a budget intentionally in the name of electronics.

Even at present, more than 50 percent of the staff newly employed every year up to a number limit at our laboratory are those who have something to do with electronics. With this in perspective, it seems we have no choice but work and push for the advancement of electronic weapons in the future research and development.

Host: You have just told us that electronic weapons amount to 50 percent of weapon development. What about the percentage of equipment expenses relative to the defense budget, and also the percentage of research expenses for the development in that budget?

Wada: Well, let me quote some of the related figures. The most important point is that the percentage of equipment expenses is slightly improving annually. It is true that the equipment expenses was often criticized to be very meager a few years ago. I believe it was 1976 when the equipment expenses became lower than 20 percent. We were then also well aware of the grave implication and closely watched the way it went.

Combining the three expenses, equipment purchasing expenses, research and development expenses and facility maintenance expenses as capital expenditures, it was the lowest, 19.6 percent, in fiscal 1976 as I have just mentioned. Then, it changed to 20.7 in fiscal 1977, 20.5 in fiscal 1978, 22.6 in fiscal 1979 and 24.4 in fiscal 1980. Compared to the period marked by 19.6, it has already improved 4.8 percent points, 20 percent by percentage. Under the circumstance, I must say the trend of expenditure is basically becoming healthier.

Host: What about development expenses?

Wada: I can tell you separately about development expenses. It was 1.21 percent in fiscal 1976, 1.25 percent in fiscal 1977, 1.24 percent in fiscal 1978, 1.28 percent in fiscal 1979 and 1.29 percent in fiscal 1980. 1.21 percent of the fiscal 1976 was also the lowest.

Host: Do you have any idea what it will be in fiscal 1981?

Wada: I am hoping somehow to improve the figure in fiscal 1981 and thereafter. However, at this stage, I cannot carelessly give you any forecast since we are in the midst of compiling the budget. I assure you the Equipment Bureau is working hard for this and thinking of pushing it up to 1.5 percent if possible.

Host: 20 percent is not necessarily a small sum for a military that has already been established, but it sounds too inadequate for a developing military. Especially, less than 2 percent for development expenses seems....

Wada: You are quite right. Even in comparison to other nations, it is certainly inadequate. Briefly referring to the percentage of research and development, in fiscal 1979, Japan was 1.28 percent whereas America was 10.61 percent. England was 13.6 percent, West Germany 4.95 percent and France 10.15 percent. Except for West Germany which was slightly low, all the others had sizable allocations. Japan was more or less one-tenth of the others.

As I have mentioned at the beginning, the Japanese research and development budget is extremely slim. Historically, Japan has been equipped with materials supplied by America. This practice has been very inexpensive, and still leaves a trail. However, it will be necessary in the future with a prospective insight to develop equipment in line with a clear vision as to what is really in demand. Also, I think it is necessary to have some setting for evaluation of the research and development results.

Yet, this is not the problem of the Defense Agency alone. Frankly, private industries have depended on imported technologies for a long time after the war. The import dependency rate was overwhelmingly high. Only recently they began to invest their time and money heavily on development. Still, I assume, if technology imports and exports are balanced, the percentage of imports will be predominant. However, speaking in terms of the monetary wind velocity, that is, contract base, at last the technology exports, maybe it is better to say technology sales, in other words, giving of technology has overridden receiving of technology. Still, as I have said before, on the basis of income and outlay, they are numerically in the red. Lack of emphasis on technical development is not a unique problem of the Defense Agency, but it fundamentally, in some aspects, reflects the tendency of the technical side in Japan as a whole, in a broader sense, the tendency of the economy and society of integral Japan. Adding to this backdrop, the tendency of the Defense Agency also reflects the particular circumstances at the starting of the agency, I am sure.

Electronic Technology Is Abreast With Other Nations

Host: Development of industries in Japan since the Meiji era has been led by the initiative of the government. Especially in the field of production and development of weapons, the only customer in sight was the government. Differences or disparities in thinking between the people and the government have been inevitable, even among those closely involved in the actual field concerned. I am sure there are various questionable points or disparate points even in matters which have not been revealed up to now. I would like you to tell us your opinions relating to these points one by one. Mr Abe of Mitsubishi, could you start, first?

Abe: We, who are involved in defense contracts, are very glad to see mass communications and others look right into the issues related to the defense of our country due to the changes in the recent international or internal conditions. I believe Chief Wada and Director Ohmori, who are presiding over this talk today, are quite busy to cope with these changes. It is really a welcome change for us who engage in the defense related works to witness a coming of a time when we can deal with our tasks based upon the national consensus formed by taking defense issues directly and discussing them openly.

First, let me clarify where we stand. We are in charge of the electronic field of defense materials. We hear that equipment modernization is projected according to the Post 4th Defense Buildup Plan or Medium Term Operations Estimate. As director Ohmori mentioned before, modernization and electronization seem to be the target of the Defense Agency, and we are hopeful that we can be more frequently called upon for our services.

On one hand, we hear that the Defense Agency is intending to raise the defense budget in correspondence to the recent heavy demand for defense efforts suitable to the national power. On the other hand, financial restrictions must be giving Chief Wada a big headache when he tries to distribute the defense budget.

Defense materials are largely divided into front equipment and rear equipment. Electronic tradesmen like us handle predominantly those that belong to rear equipment although those that belong to front equipment are not entirely excluded.

When defense efforts are to be visualized, efforts are apt to be focussed only on the front equipment due to the budget limit. We are afraid that the budget for rear equipment which concerns us electronic tradesmen will be considerably squeezed. We feel helpless that electronic tradesmen are always left behind, and we appeal to your good offices to safeguard us from such a disposition in the light of the fact that the world has entered the era of electronization.

Speaking of development, as we have just heard, the budget is certainly increasing slowly every year. However, among general business enterprises, there is a conventional understanding that a company will be left behind and will not prosper unless at least 3-5 percent of the total annual sales is invested for the development of the business. The Defense Agency provides only little more than 1 percent of the total budget for the development. That means, the agency is a risky company which is faced with potential bankruptcy in 10 years.

On the other hand, looking at the developmental investment of the corporations each of us represent today, I am positive that our companies invest for self-development much more than the sum of some 20 billion yen which the Defense Agency budgets annually for the time being. I feel it abnormal that the developmental budget of the Defense Agency is smaller than that of a private corporation. It is urged that the budget should be increased at least to 3 percent as soon as possible.

Development can be divided into two categories, development of weapons and development of basic technology. We, in the private sector, perceive that the Defense Agency invests very little especially for basic technology. Japan before the war used to, and other nations practically also rely on the military to be in charge of the development of unknown basic technologies. This delegation of the task stems from the characteristic of the military which demands weapons with the best technical know-how.

The reason for this military initiative may be found in that a nation can possess weapons superior to those in other nations only after she has invested and succeeded in projects with unfavorable odds of success. This enables the nation to keep more defense capability with less weapons.

Nonetheless, at present, the Defense Agency focuses on the development of weapons, maybe due to the limited budget for development. The agency hardly engages in the development of essential basic technologies, but relies on the development by the private sector. Under the circumstances, it is impossible to develop most advanced weapons. It is hoped that the future defense budget increase will be also invested in the development of basic technologies.

There is one more thing to add. We are very pleased to know that the developmental investment by the private sector can be of service, and would like to ask the Defense Agency to let us know by some means your long term prospect for development so that it will guide us as to what kind of defense projects are to be developed by the industries themselves. I believe the united impact of the Defense Agency's developmental investment and the corporative developmental investment will facilitate effective development. I am sure you are entertaining many good ideas. I also believe it will be very useful for the future of the defense of Japan if you, the Defense Agency, could disclose to us your vision of the future direction and prospect in the area of defense in 10 years, 15 years or 20 years.

Host: Is Mitsubishi working on F104, F4, F15 and Nike and Hawk?

Abe: Not Nike, but Sparrow.

Host: Does your other work relate to naval vessels?

Abe: Yes.

Host: In addition to that, tanks such as model 74 tank....

Abe: Also, FCS of F1 and ECM.

Let me tell you a little more about where we stand. I have been involved in this defense business for over 20 years. When I went on observation trips to the U.S. in 1955 to 1956 officiated by the technical tie-up with American companies, I felt a serious gap between Japanese and American technologies, a gap we might have never been able to fill. However, in 1965-1975, I was confident that we could catch up if we learned just a little more. Since 1975, I cannot believe why we first felt it so difficult to do the job.

Since the Japanese electronic technology is overtaking others at such a whirling pace like this, I am afraid in 10 years we will have nothing we can import from abroad.

As evidence of this trend, lately foreign technology exporters are talking about very expensive license fees. In the old days, when we were so far behind, they did not need to worry about selling the technologies. Recently, however, they like to charge us a lot in anticipation that we will become too competitive as soon as they sign out the licenses. Technical development cannot be achieved in a year or two. It takes 10 years or 20 years. Now, the time has come for us to develop our own technologies, and to start investing in this area, isn't this true?

Taking Too Long to Realize Electronic Equipment

Host: Mr Tanaka, I often associate Nippon Electric Company, Limited with the BADGE system. Since you handle very large projects, you must have plenty of headaches.

Tanaka: Yes, the present BADGE was assigned to us. We are really hoping to be able to offer our services when this BADGE will be renewed.

Host: If you have anything to add to the explanations given by the representative from Mitsubishi Electric Corporation....

Tanaka: Mr Abe has just given us a general idea. He is right. Of course, it is our own duty to protect Japan. Consensus is lately turning largely to this point, and the presence of the Self-Defense Force is said to have gained wider support. We are therefore prospecting and hoping that the future defense expenses would be enlarged not promptly but maybe at least gradually.

Well, the increase of defense expenses is naturally linked to the modernization of equipment. As previously mentioned, we are hopeful that electronics will be of great service for modernization, and in this respect, we are very anxious to cooperate with the Defense Agency.

As mentioned previously, comparing ourselves with America after the war, we felt our technologies were 10 to 20 years behind, which led us to conduct our business using imported technologies. Later on, in some fields, we went ahead. Nevertheless, as far as defense equipment is concerned, it seems to be a fact that Japan is generally far behind in progress due to the small sum which has been invested so far by the nation as a whole. As figures given before, 10 percent of the defense expenses are spent for research and development in the U.S., which is approximately the same as the total budget of the Japanese Defense Agency. As Chief Wada mentioned before, although technical development by the private sector is also in demand, we are hoping that the Defense Agency will take an active interest in research and development in order to stress the development of home-made weapons.

Another point I want to make regarding research and development is, although I am aware that the lack of defense budget is an obstacle, that it takes too long from the time research and development starts to the actual production of weapons. Sometimes it takes 10 years. Under such circumstances, technologies in the electronic field are not idle but advance far ahead while we are waiting for the product to be produced. How to deal with this time lag is one problem we must eventually solve.

Utilization of Electronic Technologies Developed by Private Sector

Host: Mr Matsuda, what kind of projects does Fujitsu Limited handle now?

Matsuda: Those related to land communications and other electronic warfare, and loading computers. Also, the Tactical Support Center (T.S.C.) of fiscal 1979 was assigned to us, which is associated with submarine surveillance aircraft.

Host: Well, there seems not much differences between what you do and what Mitsubish does....

Matsuda: That's true. I am sorry (chuckling).

Host: Do you also have some developmental works?

Matsuda: Yes, we have various developmental works, for instance, infrared weapons. We hope to get more contracts in this field, too.

Host: Not that it began after Director Ohmori took his office at the Technical Research and Development Institute, but the developmental budget of the Defense Agency is extremely all-around and thinly spread, which results in long deferred or delayed development. Besides, this all-around policy does not seem to include basic research. What do you think of this, do you have anything in mind in line with this point?

Matsuda: Well, then, may I say just a little in that context and also in addition to what you have discussed previously. I may repeat what you two have said already, but what we are thinking of is a kind of basic research. When reviewing the field of electronics, there are some differences between general electronics and electronics for weapons. When you look beyond these differences, there appears an element of basic research. I believe this is after all the field only the Defense Agency can pick up and pursue. Also, from a certain point of view, this task may not require that much money, I went too far in saying this, but I couldn't avoid using a totally contradictory expression. One of the points I wanted to note is that analytical and evaluational studies are very effective as a stimulant, although research for producing materials is also important.

Incidentally, those imported from abroad, previously mentioned by Chief Wada, are unmistakably weapons. I will not complain abou introducing these sophisticated weapons directly into our equipment system. However, isn't it recommendable for researchers and engineers in development to examine the imports with open minds, for a period for test and evaluation? If this test and evaluation is conducted from an angle of research and development, an angle different from operational evaluation given by the operators, the difference between the electronics for weapons and general electronics will be largely clarified. The second point I want to bring out is that the clarification of a certain element peculiar to weapons may work in a sense as an accelerator for the promotion of efficiency.

Thirdly, an unnecessary remark that I should have left unsaid. I believe, although repetitious, what counts is the utilization of the electronic accomplishments in general aside from the defense field. It is easy to say but difficult to practice when one tries to find an effective utilization of what has already been developed unless one tries really hard. Even within the manufacturers who have achieved electronic developments, the utilization of the developments is not so easy. Needless to say, it will be very exhausting to utilize all of these enormous amounts of accomplishments by matching them efficiently.

For this kind of task, a great deal of effort is required. It is not the matter of money, but it is after all the wisdom and effort of men that counts. To this effect, I am sorry to be frank with you, there is a definite line drawn between the government and the people, which does not allow a relationship evident between makers and users. I feel strongly that the civilians must make more efforts to establish a form of contact as seen between makers and users, and I am hoping that the public officers also will guide us into this goal.

Parallel Development of Alternatives for Shortening of Developmental Period

Host: Toshiba Corporation has been a contractor of the Defense Agency for over 10 years, hasn't it? I am sure you have some issues to talk about through your experiences to date.

Yoshida: Well, I heard you said that the private sector spends more money than the Defense Agency currently allocates for developmental expenses. If the government has enough money to pay us even when we deal only with development, as in the U.S., it is really ideal. In reality, our status will not be brought up to that perfection over night, just as the saying, "agree in general but disagree in detail." That implies that the status quo will be slowly and gradually changed for a while, and this style is the only practical way.

As discussed before, development related to defense requires a very long period of time, for instance, 5 or 10 years. As the chief of the Equipment Bureau stated, the government will guide us according to its vision of development and we are only to follow it faithfully through. However, speaking from our side, we must tie-up our best men for long periods of time to do the job since the engineers who deal with the defense-related development must be able to handle the most advanced technologies. This means we must make a great deal of human and operational investments during this period.

In order to safeguard the young men who devoted their youth to such work from moral frustrations in the later years, we request your leadership to see to it that the results of the efforts will produce fruitful weapons. If there is a doubt whether or not their efforts will be useful later, they may be demoralized. Also, speaking from the viewpoint of business operations, I am sorry to say, the fund granted is not enough to cover all the necessary expenses required for development. I am hoping that some considerations will be given to such risks involved.

Additionally, I believe we are still in need of purchasing some machine parts from the U.S. for a while whether or not we like to do so. Lately, however, the machine parts bought from abroad at some expense are discriminated against domestically developed products only because they are slightly older and the two are not combined but separately treated. This practice seems to be a waste of money paid for the imports. Some of them, although they may not be that much technically advanced compared to our products, have lots of good features as weapons, for example, they may not be wrecked even when handled by brute force. The point is how this time we are going to feed back these features to our development. I am certain proper assimilation of human engineering and tactical know-how will give us many good points for our development.

As an effort to encourage absorption of foreign know-how, I suppose you also practice this in government, but we, who engage in the defense production in private corporations, once in a while rotate some of our staffs in the development section with the staff in the production of weapons in order to standardize the knowledge, of which of course does not mean to average out the level of all, but it is meant to be useful for the development of better machine parts by assimilating good points.

One more problem is the lengthy developmental period which may last as long as 5 to 10 years. How to shorten this time lag is a big question. According to the customary methods, it takes so long to comply with a series of established procedures which comprise of initial trial model making, second trial model making, technical tests, finally, utility tests, and in addition, regularization. In order to cope with this, just as in the story of Yoshitsune and Kagetoki Kajiwara who installed oars both on the stern and the bow to accommodate two-way maneuverability, it may be helpful for our country as a whole if the government makes allowances for parallel development and change over to alternatives immediately after problems are detected with the initial project to reach an earlier completion of a system.

I believe, in addition to the conventional straight forward operation, applicational actions thoughtfully taken for some projects which may benefit from them, will shorten the developmental period.

Research and Development in Softwares Recommended

Host: I guess Hitachi Limited is also one of the older faces who receive contracts from the Defense Agency. Do you mind telling us your opinion?

Morimoto: We wholeheartedly welcome the ideas presented so far by the Defense Agency in this round table talk. The key issues of the talk are, for one thing, the enrichment of technologies original to Japan, which will be more inclined to electronization; for another, the research on the Technical Research and Development Institute's own theme, that is, the introduction of "Seeds Orient" research. Our business policy has been to "kindle small but everlasting flames." Evidently, our share of the Defense Agency's contract is small. However, lately we have come to realize our business practice is not adequate and the time has come when our company itself is starting to express the desire to serve more extensively.

Therefore, if the development of Japanese owned technologies, which has been talked about here, is ready to take off, I can honestly say that there is a way for our company, a maker which is starting later than the others, to be able to serve you in the field of research and development. Likewise, electronization is a very good idea from the point of business operations. In the past, technologies developed in Japan after so much devoted studies turned into useless treasures which were hardly applicable to anything else but defense purposes. However, with the "Seeds Orient" in particular, base technologies will be studied and far-reaching effects can be greatly expected.

With the said reasoning, first, I would like to request, as the others did, the gearing up of the technology enrichment policy.

Secondly, I would like to request that you start thinking of research and development of softwares as a developmental direction, although this request is slightly different from the others. As Watanabe and others have previously said, Japan has come shoulder to shoulder with foreign countries in many technical fields. Our weakness is not in hardware but in software in particular. I am sure we can be of service to you.

Additionally, we have some research institutes under our corporative structure. I regret to say, however, we have not sufficiently introduced these facilities to you for your contact in the past. Looking at the current ways things are going, there is a sign that the research workers themselves directly open business contacts with the Defense Agency. I would like to beg your kind and continued support in this matter.

Present State of Dependency on Private Sector for Basic Research

Host: Among various opinions and requests presented, is it a fact that the budget for basic research is insufficient, for one thing, and that the government is dependent on the private sector for various areas?

Ohmori: Well, I think that's true. Of course, if there is an ample supply of money, it will be different. How we manage to carry out our research and development within the very limited money is the question. In relation to this, we think the domestic defense technology can be categorized into three divisions.

Very simply speaking, a category represented by ammunitions, guns and missiles, which must be developed 100 percent by the efforts of the Defense Agency. Secondly, an aircraft category which will be actually operated 80-90 percent by the Defense Agency. Where basic aircraft technology is concerned, however, aircraft can serve both civilian and military needs without any discrimination once the superficial layer is removed, as you well know. As far as the said basic technology is concerned, the Defense Agency does not have to take the whole responsibility for it. The Science and Technology Agency or the Ministry of International Trade and Industry can be useful and share the responsibility. That does not mean the Defense Agency is entirely released from the responsibility. Certainly, the Defense Agency will be eagerly devoted to do the job, but the percentage of the involvement will be sizably different compared to the ammunition category.

Pertaining to the electronic equipment, as known to all, the technical level of the Japanese private sector is extremely high. In our primary stage, exaggerating a bit, the electronic features of a tank, for instance, a model 61 tank, was practically under 10 percent. In comparison, the percentage of the same increased to 20 percent in 1974 and will be increased to 30 percent in the next model to be made.

Statistical data shows that electronic weapons were scarce in the early days. As mentioned before, the electronic technology of the private sector has reached the world's top level through the history of three generations. Because the private sector attained such a high level, we fell in the pattern of asking for what we need from what you have. In a way, we have no excuse. On the other hand, we would like to use by all means your technologies renown for sophistication.

Nevertheless, the electronics for military use is much different from that for civilian use. For the portion which is different, we are convinced that we must take the initiative in conducting the studies even deep into the area of basics. We will try hard to get the budget for such an area of study. Anyhow, the research and development expenses of the Defense Agency is only one hundredth that of the U.S., and the personnel is also exactly one hundredth. With this in consideration, we cannot help but to ask for your contributions and cooperation.

Wada: Insufficiency of money is the primary restriction, of course, but before we say that, there has been a known conventional attitude of the Defense Agency or for that matter, of the entire government, an attitude that demanded a presentation of visible results without fail once the parties agreed to take the research and development work due to the official approach to research and development based upon a strong desire to obtain results produced by short work. Conversely speaking, we did not say that you could try to make something imaginative at a cost of possible failure, or you could try this and that but make something good through trial and error. I believe, however, we used to say that you should never fail to develop excellent completely finished weapons.

Under this atmosphere, when we compare the actually finished foreign products with the ones to be made at home with any 100 percent guarantee of delivery, we are likely to come to a conclusion that it is more expedient and reliable to import foreign equipment. Following this argument, we have, I suppose, been partial to introducing at least major weapon systems, especially aircraft and others such as missiles from abroad.

Host: Have you followed in that path fully in anticipation of the beneficial side of the technologies directly imported from foreign countries, for instance, you might have calculated that the imports would enhance the capability of Japanese corporations and would have far-reaching use in areas other than defense.

Wada: Responding to your question, I am afraid to say that we should have had such an affirmative policy and position to invest a great deal of money to defense related research and development in order to promote the science and technology of our country as a whole and the defense related technology, and eventually to encourage the far-reaching effect of these achievements on the private sector. Frankly, our practice to date was rather contrary. Among science and technology, it seems to me that defense technology has suffered from an extremely small budget. Whether this practice is bad or good is not the point I am driving at.

Well, I am sorry to quote statistical figures once more. However, the government's share of the expenses for research and development of the entire nation is almost one half in countries such as the U.S. and West Germany. Incidentally, this figure is much higher in the U.S. In Japan, the same share is about one quarter. The total national investment in total research and development is highly dependent on the commitments by the private sector. Among these, the investment to defense related research and development is piecemeal. You are quite right in saying so.

Develop Electronic Weapons Efficiently

Host: As somebody mentioned a little while ago, in some aspects, there is an unbearable lack of consistancy between development and equipment. Research and development cannot directly turn into equipment. Likewise, often you see that a project is assigned to one person, and when this man in charge takes another post or retires, the research and development pursued by him will disappear into thin air....

Wada: I understand you have multiple and various requests. Frankly, we feel we have achieved more than what we should be expected to in spite of such a marginal budget for technical development (chuckle). For example, we have developed PS1, F1, various missiles, model 74 tank and much more. I honestly feel we have done our work efficiently within this slim and tight budget.

Summarizing your requests presented before, first, you asked us to see to it that the results obtained by hard work be somehow utilized for actual production of weapons so that the staff engaged in research and development will not be disheartened. Another request was, I believe, that you are interested in getting our support for retrieval of the money invested by the private sector for voluntary research and development associated with the defense technologies but not covered by the money from the Defense Agency?

For your first request, we will be more careful and will comply with your request as much as possible since we agree there are some disappointments in that area. For the latter, I understand your point but I can only say that it is not possible to "agree" completely due to our national stance when you insist on recovering everything you happen to have voluntarily invested, since the voluntary investment of the civilian side was basically made, in a sense, at your own risk. I suppose risk taking the foundation of private enterprise. It is free for you to explore. Good results are welcome and will be accepted, others may not be accepted. Acceptance or rejection is truly dependent upon the private sector's discretion and contrivance.

I would like to add one word more regarding the trend of the latest equipment very briefly. As the director of the Technical Research and Development Institute has been saying for some time, fundamentally, equipment has been largely electronized in recent years. Also, a systematization trend and a PGM direction are emerging.

Electronization is, in a way, the field Japan is very good at. In trading, our electronic products are somewhat pressuring the American electronic industries. That such an electronics as I just mentioned has come to play a fundamental and key role in weapons shall be considered a great advantage or a condition for development of weapons in Japan.

Three years ago when Dr Perry, who was U.S. Deputy Secretary of Defense in charge of research and development and procurement of equipment, visited Japan, I had an opportunity to chat with him. He was originally from Silicon Valley, California, which is the center of electronics. He was engaged in research activities there, and later became the president of the company. Eventually, he was asked by Secretary Brown to move up to take the position of deputy secretary of defense. The honorable Deputy Secretary keenly emphasized his acknowledgement that Japan and America are presently the world's two greatest authorities on electronics, and his confidence in that once Japan seriously strives for research and development, she can achieve enormous results. At that time, he visited many Japanese plants. Also, when he returned to Japan last May, I heard he went home deeply impressed by the Japanese progress.

As this story tells, as far as electronics is concerned, Japan really has great technologies in hardware, software and all sorts. Now that we have concluded that the future weapons cannot be conceived without electronics, and that we talked about the difficulty for one company to assess the entire picture of the total electronic achievements, we would like to investigate fully into these matters and hope to invent a system to maintain the high technical standard of the private sector to a full extent and to utilize it to its maximum.

Abe: As you have said correctly, the voluntary investment by a business enterprise has been made for its own future, and consequently, the company itself is liable for the risks, although I believe there is a limit to what it can risk.

However, as I mentioned before, we would really appreciate it if the government reveals to us their long term vision, the outlook of their experts regarding the direction of future research and development so that we can make our investment as effective as humanly possible.... Of course, it is only a prospect, and it may or may not come true. Nonetheless, if you can disclose something along that line, corporations will use that as a guide and investment specialists in the companies will decide on the areas for the voluntary investment, which, in the end, can help use the technologies available in Japan very effectively. It would be highly useful if you can give us some kind of hint, even a dream, as to the direction of the future defense. I feel it can really help us iron things out.

Wada: I agree with the point you made. I am not denying that there are studies in the Defense Agency in the area of subjects such as long term defense systems for integral Japan, various long term estimations of our country and how to operate these systems. I am, however, doubtful if we have all the conditions ready, at the current state of Japan, to disclose everything to the private sector. I will not and cannot say any further. I suspect there are some points which obstruct the readiness for this action you requested of us. We can do so only after we succeed in gaining a concensus of opinion for preparing the conditions concerned, but hardly under the present conditions in Japan.... We cannot openly reveal everything relating to military operations, defense systems and the like to men in private business. I have a feeling that there are, in fact, environments and conditions that do not allow us to commit ourselves to that openness.

Host: Well, there's no end to this subject apparently, but referring to the said long term vision, the BADGE X of this time is very much talked about. When and how are you going to start with it?

Wada: Plans and conceptions of BADGE X is now under investigation after receiving the budget for the investigation. I wonder how it will turn out. It all depends on the future budgeting. Using common sense, I expect the basic conception will be boiled down and the future direction of the project will be set in the next fiscal year.

Host: Do you think money will be available for investigation, next year?

Wada: I believe it will be also available in the next year. Remember, we are merely talking about the future budget, and we are right at this moment in the middle of working for budgetary requests.

Host: Is this money requested for in the estimated operations of the Air Self-Defense Force?

Wada: I am sorry, but I am not allowed to answer to that effect.

Host: Will the conventional BADGE be abandoned, and will a completely new one be introduced?

Wada: Essentially, what kind of general conception of BADGE X will come up is the question including what you have asked. The comprehensive vision or conception of BADGE X is what you want to know. When deciding upon these matters, naturally the experiences obtained by operating the currently running BADGE and the respective evaluations will be taken into consideration. All I can say about this subject is that it is now under scrutiny, and nothing more.

Host: As Director Ohmori stated, Japanese electronic technology has highly advanced and each of the companies represented here has the ability to deal with it. How about the possibility of the next BADGE being....

Wada: Fundamentally speaking, we have depended on imports or technologies introduced from abroad in many areas as far as the former BADGE is concerned. However, I feel this time we can add a lot to the list of what we can use from our domestic technical resources and productive power since electronic technology has made such a remarkable progress in Japan. That is what I expect, very roughly speaking. However, it is not yet at the stage when I can give you a definite answer to these speculations.

Host: Will it be something like, you develop it with the cooperation of each company using the American imported know-how?

Wada: In essence, the questions regarding the conception of BADGE and what is to be done and the question of what's wrong or what's good with the existing BADGE and the like are currently being boiled down. After all these matters are settled, that is, after the conception of the project is confirmed, only then will we start to talk about whom and how we will ask to do the job. However, we don't have the stage prior to that consolidated yet, and consequently, I am not able to state anything at all pertaining to the question you have just raised.

Host: Do you, representatives of each company, have any requests for the areas such as improvement of weapons currently in our possession and the upgrading of their performance?

Yoshida: Recently, a component related technology has been in progress, and some components such as new IC and LSI have been extremely miniaturized. So, for the machine parts which aged to some extent, there are plenty of actors that allow space-oriented miniaturization of the conventional units.

Therefore, speaking of electronic machine parts, FCCM (Electronic Counter Counter Measure) for countering radio interruption by an enemy, for instance, requires new circuits and units. Here, it has naturally become possible to use new electronic technology and replace the conventional mono-functional unit by a multi-functional unit. Reviewing the conventional machine parts in this respect, we can come up with many contrivances which can extend the capacity of a system by refreshing its function and performance and simultaneously can consequently reduce the maintenance expenses of a set provided with an improved reliability and maintainability achieved by reforming units to semi-conductors. This is the area we would like to consult and cooperate with you, in parallel with new developments, so that the Defense Agency's budget can be effectively utilized.

Host: The advancement of the electronic technology is remarkable, and European nations eagerly export arms to relieve unemployment. What I am going to ask you, Chief Wada, may be beyond your power and requires the strong support of the entire government, but can you somehow gear things up toward the export of arms, which I am certain will help in promoting technology and reducing the cost of weapons?

Wada: MITI and the Foreign Ministry are the competent authorities in this area. The Defense Agency is on the side of the users and obtainers of the equipment. Please, consult MITI and the Foreign Ministry in matters related to the problems of the entire industries and the effects of exports on diplomacy respectively. The final process is the application of the Export Approval Standards of the MITI. That's what it probably would take to pursue your idea.

As you know, there are the "Three Principle Rules of Arms Export" which is the policy of the Cabinet, and the unified policy of the Cabinet such as the one that took effect at the beginning of 1976. I can only say that we are going to think about it within the bindings of these policies.

Host: Aren't there a considerable number of voices raised by the industries for export of weapons? Don't you think it's better to appeal for this at various opportunities you may have?

Wada: Well, to be frank with you, I am not sure but I feel the industries are rather coolly accepting the export issues. At one time, such voices were loudly audible. Recently, however, they have settled down, and I believe that the industries are now well aware of the pluses of not exporting arms.

Host: Thank you for your contributions.

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CSO: 4105

SCIENCE AND TECHNOLOGY

ASDF THUNDERSTORM DETECTING SYSTEM PROGRAM

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 8

[Text]

A program for developing new thunderstorm detecting equipment for the ASDF has entered its final stage with fabrication of the ground equipment to be finished this fiscal year. Technical tests are planned for FY 1981. If the test results turn out good, the equipment will be delivered to the ASDF for practical operation in FY 1982.

The program was launched in FY 1970 after an ASDF F-104 fighter crashed into central Kanazawa City after being struck by lightning.

Following three years of research on ground-based thunderstorm detecting equipment, the JDA fabricated two atomospheric electricity detectors, nine electric field meters, a weather radar system and a thunder data processor from 1975 to 1976. They were tested at Komatsu ASDF Base and Kanazawa City from 1977 to 1978. Also, one atmospheric electricity detector, 18 electric field meters and a data processing computer have been fabricated since 1979. Their installment is underway for the tests in FY 1981.

CSO: 4120

TR&DI TO DRAFT REQUIREMENTS FOR XSSM-II BY MARCH

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 9

[Text]

The TR&DI intends to draft operational requirements for the XSSM-II ground-launched antiship missile by the end of next March or FY 1980 and start technical development of the new missile for the GSDF in FY 1982.

The XSSM-II is designed to attack enemy ships from coastal areas. It is based on the ASM-I air-launched antiship missile developed for the ASDF. A jet engine will be used for the XSSM-II instead of rocket propulsion to improve range.

For technical research on the new missile, about ¥650 million is appropriated under the FY 1980 budget. The TR&DI has requested an additional ¥450 million for FY 1981. If the request is approved, it would be able to finish technical research in FY 1981 and launch technical development in FY 1982.

The ASDF is interested in the XSSM-II program because of an ASDF/TR&DI plan to develop a modified ASM-I using a jet engine. The modification program is expected to begin in FY 1982 after evaluation of the XSSM-II research.

CSO: 4120

TESTS OF GRENADE LAUNCHING RIFLE EXPECTED SOON

Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 9

[Text]

The GSDF/TRADI plan to carry out functional tests of a new grenade launching rifle under development in the second half of FY 1980 as practicability tests in FY 1979 turned out a method for maintaining better functions than originally required, according to informed sources.

The grenade launching rifle, as part of the GSDF's antitank weapons systems, will be deployed for smaller infantry units. Technical development started in FY 1977 after technical research under the FY 1967-71 Third Defense Buildup Program and test fabrication from FY 1975 to FY 1976.

The soldier-carried weapon is designed to be recoilless on launching unlike the Carl Gustav FFV-550 84mm antitank weapon which the GSDF has been procuring since FY 1979. Although most handcarried weapons of this kind in foreign countries have some recoil, the GSDF wants to eliminate all recoil from the new grenade launching rifle. Therefore, research has centered on how to reduce launching shock while maintaining high accuracy. The TRADI has found an appropriate launching attitude through past tests, paving the way for the final tests.

CSO: 4120

TR&DI'S RESEARCH PROJECT ON AIRCRAFT NOISE REDUCTION

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 pp 7-8

[Text]

The Technical R&D Institute (TR&DI) of the Japanese Defense Agency (JDA) submitted a report to the JDA's 22nd research evaluation meeting Nov. 12 on its research for reduction of aircraft noise levels, especially noise of low-bypass-ratio engines.

A gist of the report follows:

Purpose of the Project

There are many aircraft meeting strict noise requirements at present, However these aircraft are equipped with turbofan engines with high bypass ratios, in which noise reduction measues are employed only for fans. In engines with low bypass ratios for aircraft featuring high-altitude and high-speed capabilities, measures must be taken against jet noise as well as fan noise. So far, little research has been carried out on jet noise reduction. The project covers jet and fan noise reduction using the XF3-1 low-bypass-ratio turbofan engine.

Tests

In six different tests, the engine was mounted on a 1.8-meter stand. Noise levels were measured at a range of 30 meters from the engine for 20 seconds after the engine entered stable operation. Singles were recorded by FM multichannel data recorders. The data were processed by a frequency analyzer to compute noise level reduction.

Test Results

Fan noise can be reduced by polyamide felt noise-absorbing materials placed at the inlet and outlet of the fan. If the engine speed increases, however, jet noise rises. An exhaust silencer is effective for lowering jet noise. Thus, a combination of the noise-absorbing material and exhaust silencer will help reduce noise of the low-bypass-ratio turbofan engine. Remaining problems involves endurance. Although the exhaust silencer decreases engine power by 2 percent, a change in the shape of the silencer can reduce this drop.

CSO: 4120

TR&DI TO PROCURE BK-117 FOR MISSILE TESTS

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 p 9

[Text]

The TR&DI is expected to request ¥400 million in the FY 1982 budget to purchase a BK-117 helicopter as a craft specialized for technical tests of new missiles.

The BK-117 medium multipurpose gas turbine helicopter is now under development by MBB and KHI.

The expected request will cover IFR equipment and other optional components, spare parts, training expenses and other costs as well as a BK-117 airframe valued at ¥200 million.

The TR&DI had originally planned to procure the craft under a FY 1981 budget request. This plan was canceled because of opposition from JDA internal bureaus. However, the necessity of such a craft has increased as development of new missiles has become extensive. The TR&DI attaches importance to the craft for technical tests as well as promotion of missile research and development projects.

The BK-117 has been tentatively selected because a helicopter with hovering functions is more useful than a fixed-wing aircraft for airborne missile tests, in which the craft acts as a telemeter transmitter and an optical meter.

CSO: 4120

MELCO CONTRACT WITH MBB ON SATELLITE CONTROL SYSTEM

Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 pp 9-10

[Text]

Mitsubishi Electric Corp. (MELCO) has signed a contract with MBB of West Germany to import technology for the three-axis attitude control system for satellites. The contract will be approved by the Bank of Japan by the end of November.

The technical cooperation contract demonstrates that Japan is able to import space technology not only from the United States but from other countries. This country has so far depended on the United States for space technology.

Under the contract, MBB will check and review the controlled bias momentum formula for the three-axis attitude control system which MELCO has developed for the MOS-1 maritime observation satellite to be launched in FY 1984.

So far, Japan has imported complete attitude control systems, including a General Electric system for an experimental broadcasting satellite, named "Yuri (lily)," launched in 1978. The ETS-III technical test satellite, to be launched in 1982, will also use a GE system.

In a bid to domestically produce the control system, Toshiba Corp. once asked GE to provide technical assistance. GE rejected the request on ground that its technology involves military secrets.

Due to the rejection, the Space Activities Commission requested the domestic industry to develop a control system for the MOS-1 and other large satellites. Although MELCO has developed the controlled bias momentum formula, there are no Japanese experts to check and review it. Therefore, MELCO concluded the contract with MBB.

The Science & Technology Agency has observed the contract is extremely significant. The West German government also welcomed it at a recent meeting with Japan in Bonn under the Japan-West Germany science and technology cooperation agreement.

MELCO intends to hold experts' meetings with MBB as soon as the contract is approved by the government. Their technical cooperation is expected to pave the way for their closer relations.

CSO: 4120

BRIEFS

PROGRESS ON AW-X ANTIAIRCRAFT SYSTEM--The Defense Agency will award contracts totaling Y760 million to Mitsubishi Heavy Industries (MHI) and Japan Steel Works Ltd. for fabrication of a complete prototype of the AW-X self-propelled antiaircraft machine gun system now being developed for the GSDF by the TR&DI. MHI will handle fabrication of the chassis and Japan Steel Works the turret system. The AW-X prototype will be based on the Model 61 tank chassis and be equipped with an Oerlikon 35mm antiaircraft machine gun system. Development of the fire control and signal processing systems was funded in FY 1979. Although the Model 61 tank chassis will be utilized for the prototype, some officials suggest use of the Model 74 tank chassis for production vehicles. A decision on the chassis type for the production model will be made after evaluation of the prototype vehicle, sources report. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 10]

NEW B-X MINES PROCUREMENT--The MSDF intends to start full-scale procurement of new B-X mines in FY 1981. It has already earmarked funds for about 50 B-X mines in its budgetary request for the fiscal year. Practicability tests of the new mines by the MSDF finished in FY 1978, paving the way for full-scale deployment. Research and development of the new mine originates from the period of the Third Defense Buildup Program. The B-X mines are to be laid on sea's bottom by aircraft and ships. According to military experts, the domestically developed B-X mine is as excellent as advanced mines of major military powers. Therefore, MSDF units are eager to deploy the new mines. The B-X mine has been developed in cooperation with Hitachi Ltd., Hitachi Shipbuilding & Engineering Co., Nissan Motor Co., Oki Electric Co. and other manufacturers. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 19 Nov 80 p 10]

R&D OF AIRBORNE FCS--The TR&DI has requested about Y170 million for FY 1981 to launch research and development of an advanced airborne fire control system (FCS). It will fabricate an active phased array radar antenna for basic research from FY 1981 to 1982 and a prototype FCS in three years from FY 1983 for technical tests in FY 1985 and 1986. The prototype FCS is expected to be tested on an F-4EJ or F-1 fighter. The new FCS is designed to counter low-altitude, high-speed targets and multiple targets, and meet the requirements of future control-configurated vehicle (CCV) fighters. Total development cost is estimated at Y7,000 million over seven or eight years from FY 1981. The TR&DI aims at making the new FCS superior to the Hughes APC-65. It wants to use the system for the FS-X and other future fighters. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 p 8]

SECOND-STAGE F-1 APS PROGRAM--The Central Procurement Office of the JDA has selected Mitsubishi Heavy Industries Ltd. (MHI) to modify an F-1 support fighter to accommodate a new auto pilot system (APS) under the second stage of the TR&DI's F-1 APS development program. It will start negotiations with MHI after receiving the firm's estimate. A contract is likely to be signed next March or at the end of FY 1980. For this contract, about Y600 million is in the FY 1980 budget. A Y613,261,000 contract on fabrication of the APS for the F-1 in the first stage of the program was concluded with MHI in FY 1979. Fabrication has been undertaken by Japan Aviation Electronic Industry Co. acting as subcontractor. Technical and demonstration tests of the APS are expected to start in the latter half of FY 1981. [Text] [Tokyo JPE AVIATION REPORT-WEEKLY in English 26 Nov 80 pp 8-9]

ON ROBOTICS--Are industrial robotics the secret of the remarkable productivity shown by Japanese factories? This is quite possible in view of the commonly mentioned figures, both in Japan and abroad: according to the Japan Industrial Robot Association (JIRA), there were 54,000 robots in service in the industrial field at the end of 1979 (in other words, more than 80 percent of the world total), used mainly in the automotive, electrical assembly line and plastics processing fields. However, these statistics are biased; JIRA includes in its definition of a robot the manual manipulators (15 percent of total production) as well as the fixed-sequence manipulators (47 perc[illegible] which are not considered such by foreign manufacturers. If a stricter definition were to be adopted (variable-sequence manipulators, apprentice robots, numerically-controlled robots, intelligent robots), Japan's stock of robots would actually have amounted to 8,500 units in 1979, compared to approximately 3,500 in the U.S., out of a total world stock estimated at 16,000 units. Likewise, official growth forecasts for the production of robots are notoriously over-estimated (probably to encourage new manufacturers). Forecasts predict a genuine boom, going from 110 million dollars in 1978 to 1,200 million in 1985 (a third of which for export, as against only 3 percent in 1978). More realistic, but also less propounded estimates foresee a production amounting to approximately 420 million dollars in 1985. [Text] [Paris LE MONDE in French 18 Nov 80 p 5]

CSO: 4200 END